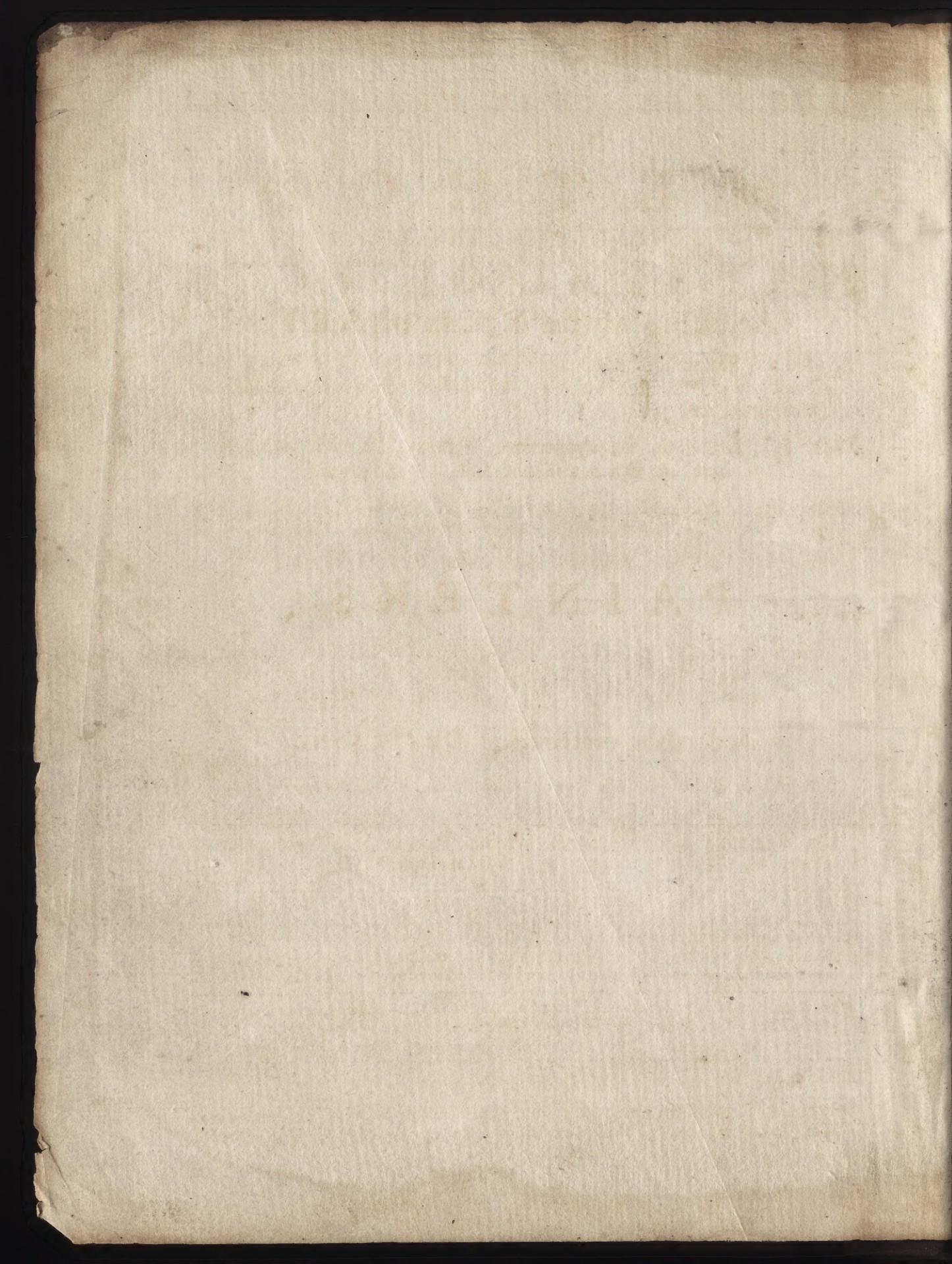




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The PRACTICE OF PERSPECTIVE:

Or, An EASY
METHOD
OF REPRESENTING
NATURAL OBJECTS
According to the RULES of ART.

Applied and Exemplified in all the Variety of Cases; as LANDSKIPS,
GARDENS, BUILDINGS, of divers Kinds their Appendages,
Parts, Furniture, &c.

With RULES for the Proportions, Positions, &c. FIGURES,
both in DRAUGHT and RELIEVO.

Also the Manner of conducting the SHADOWS by divers Luminaries; and Practical Methods of DESIGNING truly, without understanding any Rules at all.

A WORK highly necessary for
PAINTERS,

ENGRAVERS,
ARCHITECTS,
EMBROIDERERS,

STATUARIES,
JEWELLERS,
TAPESTRY-WORKERS,

And others concerned in DESIGNING.

The Whole illustrated with One Hundred and Fifty COPPER-PLATES.

Written in French by a JESUIT of Paris; since translated into German, by CH. REMBOLD and into English, by ROB. PRICKE. And now, a second Time, into the same Language, by E. CHAMBERS, F. R. S.

The THIRD EDITION.

To which is prefixed the Theory of Perspective, in which the Reasons and Grounds of the several Methods made use of in the Practice are shewed and demonstrated, by James Hodgson, Fellow of the Royal Society, and Master of the Royal Mathematical School in Christ Hospital.

If you would proceed immediately to the Practice of Perspective, without engaging in the Intricacies of the Theory, the JESUIT'S PERSPECTIVE will answer your Purpose.
Wolfius in Element. Mathes. Tom. II. p. 1048.

LONDON:

Printed for THO. BOWLES, Print and Map-Seller in St. Paul's Church-Yard;
and JOHN BOWLES, Print and Map-Seller at the Black-Horse in Cornhill,
MDCCXLIII.

СОНОВИ
СУРДА

317



THE P R E F A C E.



HE Principle or Foundation from which PERSPECTIVE arises, is the Eye; an Organ which Nature has endued with a greater Share of Vivacity and other Perfections, than the rest of the Senses; and which even holds the same Advantage over them, that the Soul does over the Body. The like Advantage does the Art of PERSPECTIVE hold over the other Mathematical Arts; being confessedly the most elegant and agreeable, and affording more Matter of Entertainment, than all the rest. 'Tis the very Soul of all Painting; and that alone which can make the PAINTER a Master. 'Tis this must conduct him in the Dispositions, Heights and Proportions of his Figures, Buildings, Moveables, and other Ornaments. 'Tis this must shew him what Colours are to be deep, or feint, or vivid, or dull; where each is to be applied; what to be finish'd up, and what only touched; where Light is to be bestowed, and where not: In a Word, 'tis this begins and ends the Painting. Without the Assistance of PERSPECTIVE, the best Master must make as many Faults as

A good Master can make in Strokes;

Strokes: And especially in Buildings, and some other Enrichments; which are Things I find some of our most reputable Painters so horribly defective in, that this has been one great Motive to my undertaking the following Work; wherein their Errors will be shewn, without naming the Authors; and Novices instructed how to avoid the like. The most consummate Master is tied to the strict Observation of every one of these Rules, on Pain of pleasing none but the Ignorant: And an indifferent Painter may be told this to his Comfort, that if he make himself a thorough Master of these Rules, he shall be able to do Wonders.

THE ENGRAVER in Copper can no more do without PERSPECTIVE, than the Painter; as having every Thing to do with the Graver, that the other does with his Pencil. From PERSPECTIVE he must learn where to lean heavily, and where lightly; what must be sunk deep, and what softned. Add, that his Occasion for this Art is more important, as his Pieces multiply to a much greater Degree than those of the Painter: So that if artfully performed, his Praise will be the greater; and if otherwise, his Failing the more notorious; each Piece being a Sort of Mouth to vilify its Author.

THE SCULPTOR and STATUARY must here learn the Heights both for the high, low, and middle Sight; the Slopes and Inclinations of Buildings, and other Bodies; the Angle for the Point of Sight; and the Proportions and Dimensions of all Objects, near and remote.

BY the same Art the ARCHITECT must learn how to make his Designs intelligible in a little Compass: He may likewise raise one Part, and leave the other in its Plan, to shew the whole Conduct and Effect of his Work. By the way, having mentioned Architecture, we must observe of how much Consequence it is, for such as practise PERSPECTIVE, to be knowing therein; the finest Pieces of PERSPECTIVE being those
of

of great and magnificent Buildings, raised according to the Order of Columns, all the Beauty whereof depends on their Measures and Proportions, which must be observed with the last Exactness, otherwise they shock and offend the Eye. Architecture, therefore, must be studied heartily: Nor can it any way be excused, to be ignorant of the same; considering with how much ease it may be learned in *Vitruvius*, *Vignola*, *Scamozzi*, and some others.

TO know the Orders of Columns, and their Characters, is not enough: He must likewise understand all the usual Dimensions of Buildings, and the several Parts thereof; as Doors, Windows, Chimneys, &c. how to dispose them to receive the Lights to Advantage, that nothing may appear maim'd, or darkly; to take care that every Thing be well supported; that nothing be useless; and that there be a Symmetry and Proportion running throughout the whole. Without such Regulation, a Piece of PERSPECTIVE, far from pleasing the Eye, will wound and offend it.

GOLDSMITHS, EMBROIDERERS, TAPESTRY-MAKERS, ENAMELLERS, and even JOINERS and others who have occasion to make Designs, are under the strictest Obligations to apply themselves to PERSPECTIVE, if they would do any Thing to deserve Applause.

THE greatest Part of such as I have known well affected to this Art have assured me, that they were discouraged by the great Number of Lines which most Authors make use of to form, and find the Places of their Objects, or Figures. Others have been cast off by the great Number of Obscurities in the Rules and Operations; and particularly from the Instructions not being immediately annexed to the Figures; so that in turning over to find them, they were apt to forget what they wanted. Now these Complaints have warned me to be more clear and methodical in my Instructions, which are plac'd immediately before

each Figure, that the Reader may have both the Rule and the Example in his Eye at once. Through the whole I have accommodated myself to the Capacity of Learners; not perplexing them with too many Demonstrations; nor using any Words but such as may be understood, at least in the Definitions. With the same view I have follow'd the common Custom of attributing Qualities to certain Things which really have them not. Thus, in considering Distance, or Removal, I have been forc'd to say, contrary to my own Sentiment, that 'tis the Pupil which receives the Rays from Objects, as if they terminated therein; whereas 'tis past Dispute, that Vision is perform'd on the *Retina* at the Bottom of the Eye; and that the Rays only pass thro' the Pupil in the way thither: Which, to some People, will appear a new Language, and not to be conceived. However, being assured that such a Piece of Knowledge imported but little to the Practice of PERSPECTIVE, I have attributed to the Pupil what really belongs to the Fund of the Eye, the proper Place of Vision, where the Species of Objects are formed; tho' there are others who refer this to the Crystalline. The Reader who requires farther Satisfaction as to this Point, may consult *Aquillo Scheiner*, and *Des Cartes*.

THO' I have strained every Nerve to render the Science easy, I don't doubt but there are several will find some Difficulty at the Beginning. But whoever can surmount the first Difficulties may go on assured, that there is nothing but he will understand, and practise; provided he takes care to master one Rule well before he turn over the Leaf to another. The Truth is, they may be said, in some measure, to hang and depend on each other: And a little Trouble of this Kind, at first, will be abundantly recompensed by the future Ease accruing from it.

IT will appear from the following Table, that this Work alone suffices to carry you thro' all the Stages and Degrees of PERSPECTIVE,

SPECTIVE, and to perform all Kinds of Draughts; by only having recourse to the several Rules, which the Figures indicate, and bringing and collating them together, to furnish out the Thing requir'd. This, no doubt, must be agreeable enough to a Person who desires to make a Draught, to find immediately what may answer his Purpose: The Satisfaction, assuredly, must far transcend that of copying a Piece already done by another. Add, that in case he be oblig'd to copy any other, he will do it with much more ease, by means hereof; inasmuch as we furnish Instructions for every Thing that can occur. I confess I take infinite Pleasure in making new Designs, and inventing new Figures; which I should have made publick, as my Predecessors have done, but that I was willing every Person should participate in the Pleasure of composing from his own Fancy; having furnish'd him with all the Means requisite thereto. Such as choose to decline that Trouble, will meet with Designs enough ready to their Hand, in *Marolois*, *Vredeman*, *Urieffe*, and others, who have affected to shew the Politeness of their Genius in this Way.

SO many fine Performances, I doubt, have help'd to render many of our Painters too lazy to learn to do what they find ready done. All they aspire at, is, to copy them as well as they can; which were excusable, did they know how to use them to the Purpose: But their way is to copy without knowing. And hence it is, that we have usually as many different Points in a Painting, as there are Objects, Lines, and Returns. Some of them will let you see the Bottom of a Thing that should only shew the Top; and others, rather than be short, will shew both. Others, again, having several Figures to shew in a Painting, will make them all of the same Height: Tho' sometimes they vouchsafe to dispense with that Rule, and make those in the Fore-part less than those behind, to give Room, as they tell

us,

us, for the hind Figures to be seen: Which is to overturn both Art and Nature at once.

TO satisfy the Curious, who are always inquisitive after the Reasons of Things, and require Order and Measure every where; I have divided this Work into five Parts. *In the first* are delivered a few Definitions, Demonstrations, and Reasons, which need no great Stock of Mathematicks, to be understood, and which yet give a deal of Light into the Subject in Hand. Thence I proceed to shew the Nature of the Point of Sight, Points of Distance, Accidental Points, Front Point, and Side Point, Visual Rays, Diagonals, Parallels, Perpendiculars, and Base Line; the previous Knowledge of which Things is extremely necessary, before you come to the Figures, and contribute exceedingly to the easy understanding the Instructions that follow. *In the second Part* we give the Methods of shortning and diminishing Plans divers Ways; with several Forms of Pavements which ordinarily serve for the Foundations of Perspective Draughts. Having given sufficient Instructions for putting all Sorts of Planes in PERSPECTIVE, we proceed, *In the third Part*, to the Elevations of divers Objects, beginning with the easiest, which are Cubes, and other Bodies of several Sides, or Faces: These are follow'd by Walls, Doors, Windows, Ceilings, Vaults, and Stair-cases of divers Forms, all without Ornaments, or Mouldings, that the Rules might be the les perplex'd with a Number of Lines which such Enrichments would have render'd necessary. After shewing all the Buildings in their Simplicity and Nakednes, I go on to furnish them with Columns, Cornices, and other Ornaments, which add a Majesty and Grace. The Houses, all built to the Roof, I shew how that is to be manag'd, with variety of Coverings: Then advance to the Insides, and give Rules for the Furniture, Moveables, &c. These are followed by Instructions relating to Streets, Gardens, Trees, Walks; which are Things that inspire

a Gaiety, and render the Draughts more entertaining. This Part is closed with two or three Contrivances for facilitating the Business of PERSPECTIVE, and even for making the finest Designs, without knowing any Thing of the Rules of Art. *In the fourth Part* we give the Measures and Proportions of Figures, both in Draughts and Paintings, their Postures, Situations, and Horizons, both for flat Paintings, and Relievo's. *The fifth and last Part* considers natural Shadows, both those of the Sun, Torch, Candle, and Lamp.

WHEN the PERSPECTIVE of a Building, Garden, Range of Trees, Pallisade, or the like, intermix'd with Figures, is intended, I would recommend it to you, to sketch out what relates to the PERSPECTIVE with a Pencil in the first Place; which done, you will proceed with more Assurance to fix the Heights of Figures, and other Circumstances.

ONE Thing some People will find to censure in this Work, *viz.* That the Points of Distance in all my Figures are too near the Point of Sight. But if this be a Fault, 'tis a voluntary one: For my Design being to teach, it was necessary every Thing should be shewn, and the Reader let to see where so many Lines were to terminate; otherwise he would have been left to his own Conjectures. 'Tis sufficient that I direct the Learner to place them farther off; and even shew the Laws and Occasions thereof. Nor can it be suppos'd I should have made any Difficulty of making them more remote, had not other Considerations prevail'd with me: One of which was, to render the Book as small, portable and cheap, as possible. Had I follow'd the Advice of some of my Friends, I should only have given a single Instruction in each Leaf; which would have swell'd the Book to about thrice its Bulk, without rendering it a whit the more intelligible.

SOME People affect to conceal the Names of the Authors they have follow'd; and, as has been well observ'd of a certain
one,

one, pilfer from private Persons what they give to the Publick. For my own share, I confess, that having propos'd to write a little Treatise of PERSPECTIVE, I was willing to see as many as I could on the same Subject; nor made any Scruple of borrowing from any of them what I found to my Purpose, with an Intention of making an open Restitution of all my private Thefts to the Publick. The first Writer of any account, is *George Reich*, in *Cap. X.* of his Works. The next, *Victor*, a Canon of *Toul*, who gives us a Number of good Figures, but is too sparing in his Instructions. After him comes *Albert Durer*, who has left us some Rules and Principles, in *Lib. IV.* of his *Geometry*. Then *J. Cousin*, who has an express Treatise on the Art, wherein are many valuable Things. After these come *Dan Barbaro*, *Vignola*, *Serlio*, *Du Cerceau*, *Sirigaty*, *Solomon de Caus*, *Marolois*, *Vredement*, *Urieffe*, *Guidus Ubaldus*, *Pietro Acolty*, the Sieur de *Vaulizard*, the Sieur *Desargues*, and lately Father *Niceron*, a Minim: All whom I have read, one after another, and not without admiring their great and happy Industry in the Service of the Publick; esteeming it sufficient Honour for me to imitate what they have done, and to be the unknown Copist of their Works. Beside those already recited, there are many others, whom I have never seen; which Multitude of Authors must be allowed an Argument of the great Esteem the Art has always been in, as well as the superior Regard paid to it by the present Age. On this Consideration, I cannot doubt but the following Work will be favourably received; especially, as it brings along with it several new Rules, and Instructions for putting in PERSPECTIVE any of the Objects ordinarily under our Senses, and, by Consequence, of performing whatever relates to that Art.



A

T A B L E

DIRECTING TO

The several Parts and Members whereof
any Perspective DRAUGHT is to consist.



PERSPECTIVE must begin with Plans, and, of Course, with such as are the most simple and easy; among which is the Square, or Cube: The Method of making the Plan whereof is found in *Pag. 19.* and that of its Elevation in *Pag. 44, 49.* *A Cube view'd in Front, and Angle-wise.* If an angular View be required its Plan is given in *Pag. 20.* and its Elevation in *Pag. 50.*

To raise the Walls of a House, or the Palisades of a Gar-Walls and Palisades. den, &c. see *Pag. 51, 52.* where you have both their Plans, and the Elevations.

Such as require the Inside of a Hall, or Chamber, in a *Inside of a Room.* front View, must take the same *Pag. 51, 52.* for the Walls; the following Page for the Doors; *Pag. 54.* for the Win-Doors. dows; and *Pag. 77.* for the Chimney. The Cieling they will find in *Pag. 31, 32, 33,* and *34.* If a Door is to be open, *Windows.* you have your Instructions in *Pag. 33.* and the Page following gives a Window or Casement open. The same Rules are *Chimneys.* to be observed when there are two or three Stories over each other, as in *Pag. 76.* To ascend to those Stories, we furnish Stair-cases in *Pag. 82, 83,* and *84.* *Cielings.* *Pavements.*

Houses viewed on the Inside are usually furnished with *Stair-case.* Moveables; most Kinds whereof are shewn in *Pag. Moveables.*

A T A B L E, &c.

96—103. The Proportions of Figures to be placed therein, are found in Pag. 122, 123, 124, 125.

Inside of a Church.

Windows.

Pilasters.

Columns.

Vault.

Dome.

Cornices and Mouldings.

Altars.

Outsides of Buildings.

Galleries.

Street.

Houses far off.

Pyramid.

Buildings viewed by the Angle.

Gardens.

Arbours.

Palisades.

Alleys of Trees.

Fountains.

To shew the Inside of a Church, a Plan must be pitched on, and put in Perspective, according to the Instructions in Pag. 37, or 41. The Walls to be raised, from Pag. 51. The Windows made like the Arches of Pag. 62, or 54. Pillars and Pilasters to be taken from Pag. 48. Columns from 87. A Vault, or Vaults, from Pag. 68—72. And a Dome, or Cupola, from Pag. 74, 75. To enrich it with Cornices, Mouldings, and other Ornaments, have Recourse to Pag. 88—92. For Altars, to Pag. 31, 32, 33, 34.

For Outsides of Buildings: The Doors, and Windows are performed as in the Insides, see Pag. 53, 54, and 106. When raised to the proper Height, the Method of roofing and covering them will be found in Pag. 107, 108. And if a Cornice, or other Ornaments be required, you have them in Pag. 88—92. Arched Galleries, both within and without Side, are shewn in Pag. 63, 66, 67, and 106.

If a whole Street of Buildings be required, you must multiply the Houses on either Side, as in Pag. 109. When Houses are made pretty deep within the Draught, see Pag. 110. In large Squares, &c. frequent in Streets, in Perspective, a Pyramid may be erected, as in Pag. 80. Or some other Statue, or Figure, or a Pedestal, as in Pag. 91, and 124.

When a Building is to be viewed by the Angle, you may take its Plan from Pag. 19, 30, and 111. and manage the Elevation as taught in Pag. 50, and 111. which give Rules for Doors and Windows therein.

Gardens in Perspective rejoice the Sight more than any Thing, on Account of their Colour, the Variety of Objects, &c. Their Plans are to be made, as in Pag. 35, 38, or 113. and Compartments contrived therein at Discretion. If Arbours be required, you are supplied from Pag. 60, or 61. If you rather choose Palisades, look to Pag. 51, and 52. And if you prefer a Grove, Thicket, or Walk planted with Trees, to either of them, Pag. 112. furnishes Variety of each. If Fountains, or *Jets d'Eau* be wanted Pag. 29. gives a Basin, and its Elevation as in Pag. 73. For Squares, or Beds, see Pag. 99, or 44. For Polygons, 45, or 46. For Statues, or Figures, which make a fine Ornament for Gardens, take the Measures from Pag. 122, or 125. For Grotto's, or Nitches,

see Pag. 74. For an Ascent out of one Garden into another, you have divers Forms of Steps in Pag. 78, 79, 80, 81. In ^{Steps.} fine, you are at Liberty to choose whatever pleases your Fancy, and may range them all in the same Piece, provided you avoid Confusion, and observe the due Symmetry and Proportions.

If you would have open Shops, without any Thing in them ^{shops.} but the Walls, you are furnished in Pag. 55. If you require them fitted up with Drawers, Boxes, &c. look to Pag. 95, ^{Boxes.} and 105.

Amphitheatres were antiently of more use in Paintings than ^{Amphitheatre-} at present, for which Reason I have chose to omit them: And ^{'res.} yet shift might be made, by taking the Plan in Pag. 29, and adding more Circles, according to the Number of Stories intended. To raise the Stories, you are to use the Lines of Elevation in Pag. 75.

For Fortifications, you have the Method of diminishing ^{Fortifications.} their Plans in Pag. 39. and the Method of raising them in Pag. 114.

To give the Shadows to Bodies of all Kinds, both those occasioned by the Sun, Candle and Torch, is shewn from Pag. 129. to the End of the Book.

Particulars see in the following Table of CONTENTS.





THE

CONTENTS.

D efinitions, Names, and Terms of the Points, Lines and Figures used in the following Work	Page 1	Of the Diagonals or Diametrals of their Sections	Page 14
Sequel of the Definitions, Names and Terms.	2	Of the Distance, or Removal	15
Methods of describing the Lines and Figures above defined	3	Advert. I. Relating to the Side-Point	16
Methods of describing the Figures	4	Advert. II. Of the Depths and Hollowings	ib.
Of circular Polygons, which are Figures of several Angles inscribed in Circles	ib.	Advert. III. Of the Measures upon the Base	17
Of the visual Rays	5	Advert. IV. Of the Base Line, and a single Point of Distance	ib.
Why a Piece of Perspective is seen better with one Eye than with two	ib.	Advert. V. Not to deceive one's self in the Measures	ib.
First Definition	6	Advert. VI. Of a single Point of Distance	18
Second, third, and fourth Definitions	7	Advert. VII. How to do without making use of the Diagonal	ib.
Why Objects appear the nearer each other, as they are more remote from the Eye	8	Advert. VIII. Of several Ways of shortening or diminishing	ib.
Why Objects appear the smaller as they are at the greater Distance	9	Of Plans viewed directly, or in Front	19
Of the Horizon	11	Plans viewed obliquely, or side-wise	20
Of the terrestrial Line	12	Of a Triangle	21
Of the Point of Sight, Point of the Eye, principal Point, or Point of Perspective	ib.	Of the Pentagon, or Five-Angle	22
Of the Points of Distance	ib.	Of the Hexagon, or Six-Angle	23
Of the accidental Points	ib.	Of the Heptagon, or Sept-Angle	24
Of the Point of the Front	13	Of the Octagon, or Eight-Angle	25
Of the Side Point	ib.	Another Method for the Octagon	26
Of the visual Rays	14	Of the Hexagon, or Six-Angle	ib.
		Of the double Octagon	27
		Of	

C O N T E N T S.

<i>Of the double Hexagon</i>	Page 27	
<i>Of the Circle</i>	28	
<i>Of the double Circle</i>	29	
<i>A Plan of Squares viewed Angle-wise</i>	30	
<i>A Pavement of Squares viewed by the Angle</i>	31	
<i>Of Squares encompassed with a List, or Fillet</i>	ib.	
<i>Pavements viewed Angle-wise, encompass'd with a Band, or Fillet</i>	32	
<i>Pavements of Squares view'd in Front, encompass'd with Lists, or Bands, whose Squares are divided by the Angle</i>	ib.	
<i>Pavement of Squares viewed Angle-wise, with Chains of Squares in Front</i>	33	
<i>Pavement of Squares in Front, with Chains of Squares Angle-wise</i>	ib.	
<i>Pavement of Octogons, intermixed with Squares</i>	34	
<i>Pavement of single Squares view'd in Front</i>	ib.	
<i>Plan of a Garden in Perspective</i>	35	
<i>Plan of a Building in Perspective</i>	36	
<i>Plan of a Church in Perspective</i>	37	
<i>Plan of a House with a Garden</i>	38	
<i>Plan of a Fortification in Perspective</i>	39	
<i>An irregular Plan and Figure in Perspective</i>	40	
<i>Another Plan of a Church in Perspective</i>	41	
<i>Preliminary Instructions necessary to the following Methods</i>	42	
<i>Of the Line of Elevation, serving to give the Heights of all Kinds of Objects in all Parts of the Plan</i>	43	
<i>Elevation of a Cube in Perspective</i>	44	
<i>Elevation of a Triangle</i>	45	
<i>A Pentagon, or Five-Angle in Perspective</i>	ib.	
<i>The Hexagon, or Six-Angle in Perspective</i>	ib.	
<i>The Heptagon, or Seven-Angle in Perspective</i>	46	
<i>The Octagon, or Eight-Angle in Perspective</i>	ib.	
<i>A double Cross in Perspective</i>	47	
		<i>That</i>
<i>A Stone fluted, or channelled star-wise, in Perspective</i>	Page 47	
<i>Of Pilasters in Perspective</i>	48	
<i>Of Pilasters viewed by the Angle</i>	ib.	
<i>Effect of the Difference of Horizons</i>	49	
<i>Elevation of Objects viewed by the Angle</i>	50	
<i>To raise Objects of any Heights, and remove them to any Distance at Pleasure</i>	51	
<i>Of Walls viewed in Front</i>	52	
<i>Another Wall viewed by the Angle</i>	ib.	
<i>To place a Door in any part of a Wall at pleasure</i>	53	
<i>To draw Windows in Perspective</i>	54	
<i>Of Cielings</i>	55	
<i>Another Disposition of Cielings in Perspective</i>	57	
<i>Circular Gates and Arches view'd directly</i>	59	
<i>Round Arches over Pilasters view'd in Front</i>	60	
<i>Gothic Arch, or Arch in the third Point</i>	ib.	
<i>Sequel of the former Figure</i>	61	
<i>To describe, and put in Perspective, round Arches and Doors</i>	62	
<i>To describe and put in Perspective, double Arches and Gates, i. e. such as shew their Thickneses</i>	63	
<i>Another Method for circular Arches</i>	64	
<i>Arches viewed obliquely in Perspective</i>	ib.	
<i>Flat Arches</i>	65	
<i>To raise Arches upon Pilasters or Columns</i>	67	
<i>Gothic Arches</i>	ib.	
<i>To find cross Vaults in Perspective</i>	68	
<i>To draw the same Vault more accurately</i>	69	
<i>To form narrow Vaults</i>	70	
<i>A Vault on the Foot of the preceding Rules</i>	71	
<i>Arches and Gates with three Sides</i>	72	
<i>An Arch with five Sides</i>	ib.	
<i>Elevation of round Objects</i>	73	
<i>Elevation of Pilasters</i>	ib.	
<i>A Vault in Form of a Shell in Perspective</i>	74	
<i>Open Domes, or Vaults in Perspective</i>	75	

C O N T E N T S.

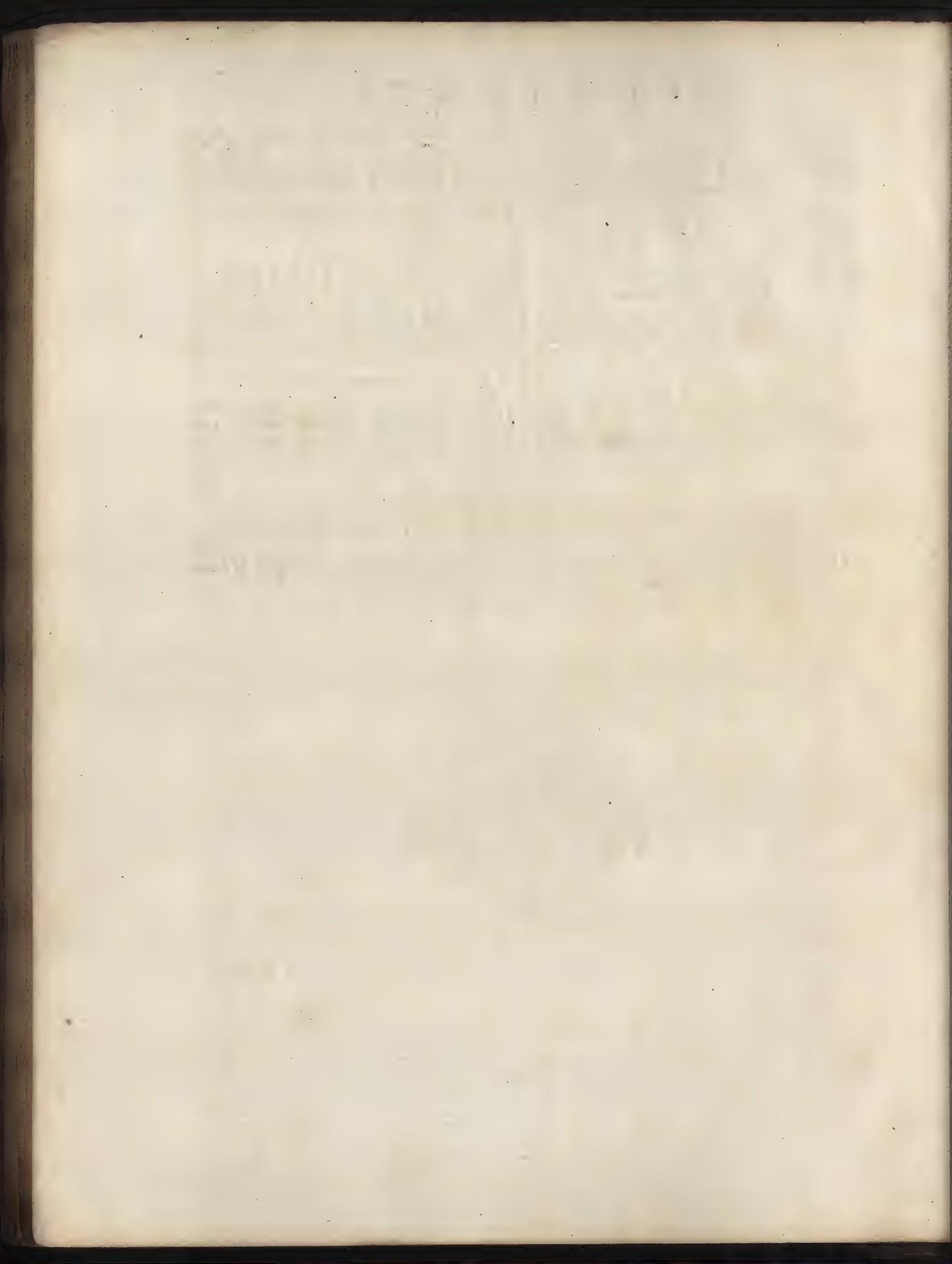
<i>That a Number of Objects, and Plurality of Stories, only admit of one Point of Sight</i>	Page	104
	76	
<i>To put Chimneys in Perspective</i>	77	
<i>Stairs in Perspective</i>	78	
<i>Stairs open, or perforated underneath</i>	79	
<i>Stairs viewed in Front</i>	ib.	
<i>Stairs that shew four Sides</i>	80	
<i>Another Manner</i>	ib.	
<i>Stairs view'd side-wise in Perspective</i>	81	
<i>Stairs in a Wall in Perspective</i>	ib.	
<i>A Stair-case with Landing-places in Per- spective</i>	82	
<i>Winding or spiral Stairs in Perspective</i>	83	
<i>Squares with Circles therein, in Perspec- tive</i>	84	
<i>Round Stairs in Perspective</i>	85	
<i>Round Steps view'd side-wise</i>	ib.	
<i>Winding Stairs</i>	86	
<i>Columns in Perspective</i>	87	
<i>Cornices and Mouldings in Perspective</i>	88	
<i>A large Cornice above the Horizon in Per- spective</i>	89	
<i>To find the Bottoms of large Projectures</i>	90	
<i>Cornices and Mouldings below the Horizon</i>	91	
<i>Cornices with several Returns</i>	92	
<i>The Apertures of Doors in Perspective</i>	93	
<i>Apertures of Casements in Perspective</i>	94	
<i>Apertures of Casements with Embrasures</i>	ib.	
<i>Divers other Apertures</i>	95	
<i>Plans and first Elevations of Moveables</i>	96	
<i>Elevations of Moveables</i>	97	
<i>To make the upper Part of Tables, Stools, &c.</i>	98	
<i>Elevation of Buffets and Cup-boards</i>	99	
<i>Elevations of Chairs</i>	100	
<i>Another Method of putting Moveables in Perspective</i>	101	
<i>Moveables placed without any Order</i>	102	
<i>Moveables laid or tumbled on the Ground</i>	103	
<i>Altars in Perspective</i>	104	
<i>Shops in Perspective</i>	105	
<i>Buildings viewed on the Outside</i>	106	
<i>Roofs of Houses in Perspective</i>	107	
<i>Sequel of the Roofs in Perspective</i>	108	
<i>To put a Street in Perspective</i>	109	
<i>That remote Objects do not shew their Thickness</i>	110	
<i>Buildings view'd by the Angle</i>	111	
<i>To put Walks, with Rows of Trees, in Perspective</i>	112	
<i>To put Gardens in Perspective</i>	113	
<i>Beds with Borders</i>	ib.	
<i>To put Fortifications in Perspective</i>	114	
<i>To make Designs in Perspective</i>	115	
<i>Reduction of Perspective Draughts out of small into great, and out of great into small</i>	116	
<i>Apparatus to the universal Method of the Sieur G. D. L.</i>	117	
<i>An universal Method of performing Per- spective, without having the Point of Distance out of the Painting, or Ground of the Work, made publick by the Sieur G. D. L.</i>	118	
<i>To give any precise Distance requir'd, with- out removing the Point of Sight out of the Piece</i>	119	
<i>A very curious Method of drawing all Per- spectives in the most natural Manner, without observing the Rules</i>	120	
<i>Another elegant Manner of practising Per- spective, without understanding it</i>	121	
<i>Figures in Perspective</i>	122	
<i>For Figures that have the Eye in the Hor- izon</i>	ib.	
<i>For Figures that have a low Horizon</i>	ib.	
<i>For Figures that have a high Horizon</i>	123	
<i>For Figures that have their Feet in the Ho- rizon</i>	ib.	
<i>Figures raised above the Plan</i>	124	
<i>The Postures of Figures in Perspective</i>	125	
<i>Beasts and Birds in Perspective</i>	ib.	
<i>To find the Height of remote Figures, where- of the first is on a Mountain near the Eye</i>	126	
	To	

C O N T E N T S.

<i>To give the natural, or any other Height, to Figures much elevated</i>	<i>Page 127</i>	<i>To find the Sun's Shadow for human Figure</i>	<i>Page 139</i>
<i>To find in what Proportion Figures grow less to the Eye, when placed over one an- other</i>	<i>ib.</i>	<i>An easy Method of finding the Shadow of the Sun</i>	<i>140</i>
<i>Measures for elevated Figures</i>	<i>128</i>	<i>Shadows from a Torch, Flambeau, Candle, and Lamp</i>	<i>141</i>
<i>Origin of Shadows</i>	<i>129</i>	<i>Of the Foot of the Luminary</i>	<i>142</i>
<i>Of the Difference of Shadows</i>	<i>130</i>	<i>To find the Shadows of a Torch on all the Sides of a Room</i>	<i>143</i>
<i>To find the Form of the Shadows</i>	<i>131</i>	<i>The Shadow of an erect and inverted Py- ramid by Torch-light</i>	<i>144</i>
<i>Shadows from the Sun</i>	<i>132</i>	<i>The Shadow of a Cross</i>	<i>ib.</i>
<i>The Shadows of the Sun are equal in Ob- jects of the same Height, tho' at a Dis- tance from each other</i>	<i>133</i>	<i>To find the Shadows of round Objects by Torch-light</i>	<i>145</i>
<i>Of Shadows, when the Sun is directly op- posed to the Eye</i>	<i>134</i>	<i>Shadows on several parallel Planes</i>	<i>146</i>
<i>For the Shadows of perforated Objects</i>	<i>135</i>	<i>Shadows of Ceilings by Torch-light</i>	<i>147</i>
<i>Shadows assume the Form of the Planes they are cast upon</i>	<i>136</i>	<i>To find the Shadow by the Foot of the Lu- minary</i>	<i>148</i>
<i>To find the Shadows of Objects broader at Top than at Bottom</i>	<i>137</i>	<i>The Shadow doubled</i>	<i>ib.</i>
<i>To find the Shadows of Objects suspended from the Ground</i>	<i>138</i>	<i>The Shadows of human Figures by Torch- light</i>	<i>149</i>
		<i>The different Positions and Heights of Sha- dows by Torch-light</i>	<i>150</i>



S O M E



T H E
T H E O R Y
O F
PERSPECTIVE.

By *James Hodgson, F. R. S.*

D E F I N I T I O N S.

1. PERSPECTIVE is the Art of describing on a plain Surface the true Representation or Appearance of any given Object, as seen from one determinate Point for any given Distance and Height of the Eye.
2. The Perspective Table, or Plane, is that Surface whereon the Picture of the Object is formed, according to the Rules of Perspective as ABCF. See Fig. 1.
3. The geometrical or ground Plane is that Surface whereon the Perspective Table is supposed to stand, as GIKL.
4. The Height of the Eye is equal to the Length of a Perpendicular let fall from it to the ground Plane, as EH.
5. The Distance of the Eye from the Picture is equal to the Length of a Perpendicular drawn from the Eye to the Perspective Table, as ED.
6. The common Section of the Perspective Table with the ground Plane is called the Ground Line or Section, as AB.
7. The horizontal Line is a Line in the Perspective Table or Picture, parallel to the Section or ground Line, and of the Height of the Eye above it, as MDN.
8. The principal Ray is the Line drawn from the Eye perpendicular to the Table, and is therefore equal to the Distance of the Eye from the Table, as ED.

The T H E O R Y

9. The Distance of any Point in the ground Plane from the Table is a Perpendicular drawn from that Point to the Ground Line or Section, as Q.T.
10. Direct parallel Lines are such as cut the Ground Line or Section at right Angles, as Q.T and S.O.
11. Oblique parallel Lines are such as cut the Ground Line or Section at oblique Angles, as X.T and Y.Z.
12. Transverse parallel Lines are those Lines which cut the direct parallel Lines at right Angles, as P.R and Q.S.
13. Radial Lines, or Visual Rays, are such as run up from Points on the ground Line, and unite in some certain Point in the horizontal Line, namely, either in the Point of Sight or in an accidental Point, as D.T, D.Z, D.O.
14. The Point of Sight is that Point in the Picture, which is found by drawing a Perpendicular from the Eye to the Perspective Table or Picture, in which all the direct Rays concur as the Point D.
15. The accidental Point is that Point in the Picture, where Lines that fall obliquely on the ground Line or Section, but parallel amongst themselves, unite or concur as the direct Rays do in the visual Point, as the Point E. *See Fig. 2.*
16. The Point of Distance E is a Point in the horizontal Line of the Table or Picture removed as far distant from the visual Point D in the 2d Figure, as the Eye at E in the first Figure is distant from the Table or Picture A B C F, namely, D.E.
17. The Point of Incidence is a Point in the Ground Line or Section, where a Perpendicular let fall from any Point in the geometrical Plane intersects it, as the Point T or Z. *See Fig. 1.*
18. The Perspective of any Point is that Point in the Picture, where the visual Ray drawn from the Eye at E to any Point, as P, in the geometrical or ground Plane, intersects the Picture or Table as the Point p.
19. The Perspective of a Line is the common Section of the Table or Picture, and the imaginary Plane formed by an infinite Number of Rays flowing from the Eye at E, and falling upon every Point of the Line R S to be represented, as the Line r s.
20. The Perspective of any Plane Figure is the Section of the Cone or Pyramid of Rays, whose Vertex is the Eye, and Basis the Figure proposed, made by the Plane of the Table or Picture.
21. The Perspective of any Solid upon the Table or Picture is the aggregate of the Perspectives of all the Planes whereof the Solid is composed.
22. The optick Angle, under which any Object appears, is formed by two Lines drawn from the Center of the Eye, to the two Extremities of the Object, and here it is to be noted, that the most convenient Distance of the Eye, from the Extremities of the Object should be nearly equal to the longest Dimension of the Object, whether Breadth or Height.
- For as the Beauty of Perspective depends upon the Point of Distance, so the Eye ought never to be placed too near the Object, nor too far from it, but at a convenient Distance; and never nearer to the Object than one half of the largest Dimension, for in this Situation the visual Angle will be a right Angle or 90 Degrees; and as this is the largest Angle that the Eye can well discover at one cast, so if it

be made less than 45 Degrees, the Object will be too much contracted, and the Visual Angle will be so small that the Returns in Buildings would not be distinguished, and the Whole would appear confused, and therefore when the Visual Angle is about 60 Degrees, which agrees with the above-mentioned Limitation, then the Object is seen with the most Advantage, and consequently in all Perspective Designs they ought to come as near this Situation as possible.

23. When the Projection of any Object is made on a Plane parallel to the Horizon by Rays parallel and perpendicular to the same Plane, the Representation of the Object in this Case is called the Ichnography of the Figure proposed, whence the Base, Bottom or Platform, whereon a Body or Building is erected, is called the Ichnography of that Building, so that to project the Ichnographick Representation of any Building is to draw the exact Ground Plot of the same Building; thus the Geometrick Ichnography of a Column is a Circle, of a Pedestal is a Square, &c.

24. When the Projection is made on a Plane perpendicular to the Horizon by Rays parallel and perpendicular to the Plane upon which the Object is represented, the Representation in this Case is called the Orthography of the Figure proposed; thus the upright Front of any Building or Object is called the Orthography of that Object or Building, so that to draw the Orthographick Representation of any Object or Building is to draw the exact Front of the Object or Building as it really is and appears to be.

25. But when the Representation or Projection of any Object is made by Rays flowing from the several Parts of the Object, as the Front, Top or Bottom, Side or Sides, and uniting in one Point where the Eye is supposed to be placed, the Representation of this Object (upon a Plane placed before the Eye standing at Right Angles to the Line drawn from the Eye perpendicular to the Object, and) formed by the Intersection of the several Rays with this Plane, is called the Schenography of that Object, so that to draw the Schenographick Projection or Representation of any Object is to draw the Projection or Representation of the several Parts of that Object, as they will appear to the Eye situated at a convenient Distance from the Object upon a Plane placed perpendicular to the Horizon, and in a proper Situation to receive the Object; and how this is to be done, is the proper Business of Perspective.

A X I O M S.

1. The common Intersection of two Planes is a Right Line.
2. If two Right Lines meet in a Point, a Plane may pass through them both.
3. If two or more Right Lines are parallel to each other, they will all be in the same Plane; that is, if a Plane passes through any two of these, it will pass through all the rest.
4. If two or more parallel Right Lines are cut by another Right Line, there may be a Plane that will pass through them all.
5. If two parallel Planes are intersected by another Plane, the common Intersections will be parallel to each other.

The T H E O R Y

6. Lines parallel to the same Right Line, or to parallel Lines, are parallel one to another ; conceive the same of parallel Planes.

7. Every Point in any Right Line is in any Plane that Line is in.

8. A Space seen under a less Angle appears less, and the same Space seen under a bigger Angle appears bigger, and consequently Spaces seen under equal Angles are equal amongst themselves.

N. B. In this Axiom we suppose the Spaces viewed stand at Right Angles to the Axis or principal Ray issuing directly from the Eye, or which is the same Thing, that they are parallel to the Perspective Table, for in other Cases, where the Diameter of the Object is inclined to the Table, it will not hold good.

T H E O R E M I.

If the Eye be placed any where between two parallel Right Lines, the farther these Lines are produced from the Sight, the nearer they will seem to approach each other. See Fig. 3.

Let S represent the Seat of the Eye, E M and Q N the two given parallel Lines, and S V the Axis or principal Ray, through the Points A C and M draw the Lines A B, C D and M N perpendicular to the principal Ray S V, and these Lines will be parallel and equal to each other. Also from S, the Point of Sight, let the Rays S A, S B, S C, S D, S M, S N be drawn.

Demon. Because the right angled Triangles S Q B, S Q D, have the Perpendicular S Q common to them both, but have the Base Q D of the Triangle S Q D, greater than the Base Q B of the Triangle S Q B, therefore the Angle S D Q, of the Triangle S Q D, will be less than the Angle S B Q of the Triangle S Q B ; consequently the Angle P S D, which is equal to S D Q, will be less than the Angle O S B, which is equal to S B Q, and consequently the double of the Angle P S D, or the Angle C S D, will be lesser than the double of the Angle O S B, or the Angle A S B, wherefore the Line C D will appear less than A B by the 8th Axiom, and consequently the Points C and D of the Parallels E M and Q N will appear to the Eye placed at S nearer than the Points A and B of the same Parallels E M and Q N. After the same manner it may be proved that the Line M N, which is placed farther off from the Eye at S than the Line C D, will appear less than C D, and consequently the Points M and N will seem to approach nearer to each other than the Points C and D which are nearer, and that the same Line M N being placed at a greater Distance than S V from the Point of Sight will appear lesser, and consequently the Points M and N in the last Situation will seem to approach nearer to each other than in the present Situation, and thus successively, till at last the Line M N will appear indefinitely small, and the Points M and N will seem to come together.

Let us now suppose the Eye, see Figure the 4th, placed above the Plane passing through the given Parallels, and let E M and Q N be the Parallels themselves.

From H, the middle Point of the Line E Q, erect the Perpendicular H S equal to the Height of the Eye above the Plane, then will S be the Place of the Eye ;

of PERSPECTIVE 5

from the Point S draw the Rays S E, S Q, S A, S B, &c. now because the Angles S E A and S Q B are right Angles, the Hypotenuses or Rays S A and S B will be longer than the Perpendiculars S E and S Q, and inasmuch as both Triangles have the Sides S E and S Q equal to each other, it follows that the Angle Q S E will be greater than the Angle B S A, and consequently the Line A B will appear less than the Line E Q by Axiom the 8th, and the Points A and B will seem to be nearer to each other than the Points E and Q, and by the same way of Reasoning it will follow, that the Angle D S C will be less than the Angle B S A, consequently the Line C D will appear less than the Line A B, and the Points C and D will seem to come nearer to each other than the Points A and B, &c. which was to be demonstrated; and the same Consequences will follow if we suppose the Point S placed below the given Plane of Parallels.

Let us now imagine a Plane, as E M N Q, to pass through the Parallels E M and Q N, it is manifest that to the Eye placed in the Plane itself or above or below it, as in Figure the 4th, the two Extremities M and N which are farthest from the Eye will appear the nearest to each other, and the farther they are produced the nearer they will approach, till at last being indefinitely produced, they will seem to meet in a Point, and the Distance will vanish.

And the same Consequence will follow in whatsoever Situation the Plane is placed, whether it be perpendicular to the Horizon, or parallel to it, or inclined to it at any given Angle.

Hence we see why Rows of Trees, of Columns, of Pilasters, why Walls and the Sides of Buildings contract themselves and seem to grow narrower and narrower the farther they are extended from the Eye.

Hence we see the Reason why Floors and Pavements of Buildings seem to rise upwards towards the Eye of the Spectator, as is very visible in long Rooms or Galleries, and why the Cielings seem to sink gradually downwards towards the Eye, whilst the Sides of the same Building seem to come closer and closer, that the Right-side seems to approach towards the Left, and at the same Time the Left-side seems to approach toward the Right-side, each Dimension growing lesser and lesser, and approaching nearer and nearer, the longer the Room is, till at last if the Length be indefinite, they will all vanish into the Visual Point.

Hence we see the Reason why the Horizon appears higher than really it is, and that the convex Surface of the Sea to an Eye placed upon it appears curved and protuberant, and different from what it really is in itself. And,

Hence we see also the Reason why Statues and Pictures placed at a considerable Height above the Eye, also why Ornaments placed upon the Tops of Churches or other publick Buildings appear so much smaller than really they are, as well in Breadth as in Height, and hence are drawn Rules for giving them their due Proportion of Magnitude according to the several Stations allotted them, also for Portraits drawn upon Cielings or set up at any considerable Height, and for a great Variety of Appearances too many here to enumerate.

Now inasmuch as the visible Magnitude of the Lines A O, C P, M V, see Figure the 3d, or their Doubles, namely the Lines A B, C D, M N, are as the Tangents of the optick Angles, A S Q, C S P, M S V, to the several Radii S O, S P,

The T H E O R Y

S P, S V, or to their several Distances from the Eye, it follows that the visible Magnitude of any Object increases or decreases in its various Approaches to or Removes from the Eye in a reciprocal Proportion to its several Distances from it: And hence,

The visible Magnitude of any Body being given, and its Distance from the Spectator, the true Magnitude of the same Body may be found, and on the contrary, the true or real Magnitude of the Object being given, its visible Magnitude at any given Distance may be determined; and hence we are taught to find of what Magnitude any Object ought to be made to appear of a given Bigness at a given Distance.

These Laws extend to Objects that are placed above or below the Eye, as well as to Objects that are placed upon the same horizontal Plane with the Eye, provided they be placed at the same Distance from the Eye; but if they are erected perpendicularly over the Plane, their Altitudes must be increased in the Proportion of the Difference of the Tangent of the Angle of Elevation, and the Tangent of the same Angle of Elevation increased by the optick Angle of the Figure when viewed upon the horizontal Surface, and consequently the higher any Object is placed above the Eye, the greater will be the Difference between the Tangents of the several Angles of Elevation, and the Tangents of the same Angles of Elevation increased by the horizontal optic Angle of the Figure, and consequently the greater must the real Magnitude of the Object be made to appear of the same Bigness as if it was placed upon the same horizontal Plane with the Eye.

T H E O R E M II.

If any Line in the Object be parallel to the Ground-line, its Perspective in the Picture will be parallel to the Ground-line also.

Let M N O P, see Figure the 5th, be the Picture or Perspective Table, S the Place of the Eye, and A B parallel to the Ground-line O P, the Line to be drawn in Perspective.

From S, the Place of the Eye, to the Extremities A and B of the Line A B let the Visual Rays S A, S B be drawn to cut the Perspective Table in the Points a and b. If these Points a and b be joined together by the right Line a b, I say this Line a b in the Table, which is the Perspective of the Line A B the given Object, will be parallel to the Ground-line O P.

Imagine a Plane as K A B L to pass through the Line A B, and to stand at Right Angles to the Plain C D R Q, now because the Lines a b and A B are the common Intersections of the parallel Planes M N O P, and A B K L, by the Visual Plane S A B, they will be parallel by the 5th Axiom, but A B is parallel to the Ground-line O P by Hypothesis, therefore its Perspective a b in the Table will be parallel to the Ground-line also, by the 6th Axiom which was to be proved; and inasmuch as the same Consequence will follow in whatsoever Place of the Plane C D Q R, the Line A B is seated, provided it be parallel to the Ground Line A B, or at whatsoever Distance from the Eye the Plane C D R Q is fixed, it follows that all Lines, that are parallel to the Ground-line of any Picture will, when drawn in

of P E R S P E C T I V E.

7

in Perspective, be parallel to each other and to the Ground-line also. Again, because the Triangles $S a b$ and $S A B$ are similar, $S X$ will be to $S x$ as $A B$ to $a b$ but $S X$ is to $S x$ as $S Z$ to $S E$, therefore, by a Similitude of Ratios, $a b$ will be to $A B$ as $S E$ is to $S Z$, that is, the Length of the Perspective Line in any Picture is to the Length of its Original Line, as the Distance of the Eye from the Picture or Perspective Table to the Distance of the Eye from the Plane of the original Object.

T H E O R E M III.

The Perspective of any Line, that is perpendicular to the Ground-line in the Original Plane, will, when drawn on the Perspective Table, run up into the Point of Sight.

Let S , see Figure the 6th, be the Place of the Eye, $M N O P$ the Perspective Table, $M N$ the horizontal Line, E the Visual Point, $O P$ the Ground-line, and $P R$ the given right Line cutting the Ground-line $O P$ at right Angles in the Point of Incidence P , I say, if from P , the Point of Incidence, to E , the Visual Point, the Line $E P$ be drawn in the Picture, the Perspective of every Point R in the given Line $P R$ will be found somewhere in the Line $E P$, in the Picture.

Produce the Lines $S E$ and $R P$ to G and Q , and draw the Line $S Q$.

Because $S G$ and $Q R$ are parallel, and the Line $E P$ intersects them both in the Points E and P , they will all be in the same Plane $S Q R G$ by the 4th Axiom; and because the Point of Sight S , and the Point R will be always found in this Plane, the Perspective of the Point R will always be found in the common Intersection of this Plane $S Q R G$, and the Plane of the Perspective Table $M N O P$, that is in the Line $E P$, and consequently in the Point r , where the Ray $S R$ drawn from the Eye at S to the given Point R in the Line $P R$ intersects the Line $E P$ drawn from the Point of Sight E , to the Point of Incidence P , and consequently if the Point R were placed in the Point P , the Point P will be the Perspective at the Point R , and the farther the Point R is removed from the Point P , the higher will its Perspective r be in the Table, and the nearer will it approach to the Visual Point E , till at last, being removed at an indefinite Distance from the Point of Incidence P , it will be projected in the Visual Point E , and consequently the Line $E P$ in the Picture will be the Perspective of the Right Line $P R$, drawn perpendicular to the Ground-line $O P$ in the original Plane, and indefinitely produced, which was to be proved.

After the same manner it may be proved that any other Right Line, as $O D$, indefinitely produced, that cuts the Ground-line at Right Angles, will be represented in the Perspective Table by the Line $E O$, drawn from the Point of Sight E in the Table to O , the Point of Incidence or Point where the Line $O D$ cuts the Ground-line.

Whence it follows, that all straight Lines in the original Plane, that cut the Ground-line at Right Angles, will when drawn upon the Perspective Table meet or intersect each other in the Point of Sight.

T H E O R E M

T H E O R E M IV.

The Perspective of any Line in the original Plane, that cuts the Ground-line at oblique or unequal Angles, will be found in that Right Line that is drawn from the Point of Incidence P, to the Point A in the horizontal Line of the Table, which is found by drawing a Line, as S A from the Eye at S, parallel to the original Line P R, till it intersect the horizontal Line of the Table M N. See Fig. 7.

Because the Lines S A and P R are parallel by Hypothesis, and A P intersects them in the Points A and P, they will all be found in the same Plane S A P R by the 4th Axiom, and consequently the Perspective of the Point R will be found in the Table in the Point r, where the Ray S R shall intersect the Line A P, the common Intersection of the Plane S A P R, and the Perspective Table M N O P, and if the Line P R be indefinitely produced from the Point of Incidence P, that is, if the Point R be removed at an indefinite Distance from the Point P, its Perspective will be in the Point of the Table at A, that is, the Line A P will be the Perspective Appearance upon the Table of the Line P R produced indefinitely.

After the same manner it may be proved, that any other straight Line, as O D, indefinitely produced will be projected on the Perspective Table into the Right Line A O, drawn from the Point of Incidence O to the Point found A, whence it follows, that all straight Lines that fall obliquely on the Ground-line, yet if they be parallel amongst themselves, they will all unite or intersect each other in some Point in the horizontal Line, and that Point is called the accidental Point; and to find it,

From the Eye Point S draw a Line parallel to the original Line upon the horizontal Table, and where this Line cuts the horizontal Line it will give the accidental Point.

Hence it follows, that if the Eye be placed any where in the Line A S, produced from A towards S as far as you please, the same converging Lines on the Table will be the Perspectives of the same Parallels in the Ground-plane, and hence innumerable Points of Sight may be assigned for viewing the same Picture, and hence we have a Solution of that Perspective Paradox, that the same Representation of any original Object will be projected on the Table in the same Lines, though the Eye should change its Place and Distance.

This Proposition is of very great Use, and therefore ought to be thoroughly understood, it being the main and principal Foundation of all the Practice in Perspective, and indeed the preceding or third *Theorem* is nothing but a particular Case of this general Proposition. Though I have given it a Place by its self for Order's Sake, since when the Lines on the original Plane fall at right Angles upon the Ground-line, the Point of Concourse of these Rays will be found by drawing a Line from the Eye perpendicular to the Picture, and this will necessarily give the Point of Sight to which all the Lines, that fall perpendicularly upon the Ground-line on the original Plane, must necessarily tend, as has been proved in the third *Theorem*.

And

And in as much as the Line drawn from the Eye to the Point of Distance upon the Perspective Table must necessarily form an Angle of 45 Degrees, with the Principle Ray or the horizontal Line, the containing Sides of the Right Angle being equal, it follows that the Diagonals of all Squares, one of whose Sides is parallel to the Picture, and all other Lines that form an Angle of 45 Degrees with the Ground-line, will have the Point of Distance upon the Table for their Point of Concourse; and where, if produced upon the Table, they will all center.

THEOREM V.

The Projection or Perspective of any Line, that is perpendicular to the horizontal or Ground-plane, will on the Picture or Perspective Table be perpendicular to the Ground-line.

Let $N M O P$, in Fig. 8. represent the Perspective Table, $C D K Q$ the horizontal or Ground-plane, S the Place of the Eye, and $A B$ the Line to be projected, which in the present Case is supposed to be perpendicular to the horizontal Plane $C D K Q$, imagine the Plane $R T Z X$ to pass through the Line $A B$, and to be parallel to the Picture $M N O P$; now because $S B A$ is another Plane intersecting the two former Planes, their common Sections, or the Lines $A B$, $a b$, will be parallel to each other by the 5th Axiom, but $A B$ is perpendicular to the horizontal Line $X Z$, therefore $a b$, if produced to G , will be perpendicular to the Ground-line $O P$, which is parallel to the Line $X Z$, the Ground-line of the Plane $R T Z X$. w. w. d.

And since the same Consequence will follow if the Line $A B$ be set upon any other Point of the horizontal Table, it follows that the Perspective Representation of all Lines, that on the Ground-plane are erected perpendicularly, will when projected on the Perspective Table be perpendicular to the Ground-line and parallel to each other. And in as much as the Line $a b$ is to the Line $A B$, as $s b$ is to $S B$, that is, as $S E$ is to $S L$, it follows that $a b$, the Perspective of $A B$, is to its Original $A B$, as $S E$, the Distance of the Eye from the Perspective Table, to $S L$, the Distance of the Eye from the Plane of the original Object.

Again, through the Point a in the Picture, the Perspective of the Point A in the Ground-plane, draw $x z$ parallel to the Ground-line $O P$, to cut the Rays $S X$, $S Z$, in the Points x and z , then will $x z$ in the Picture be the Perspective of the Line $X Z$ on the Ground-plane, and because, by the Similitude of the Triangles $s a x$ and $S A X$, it will be as $A X$ is to $a x$, so is $S A$ to $s a$, and so is $S E$ to $S L$, and so is $a E$ to $a S$, and so is $a b$ to $A B$; whence it follows that $x a$ is to $X A$, as $a b$ is to $A B$, that is, any perpendicular on the Ground-plane is to its Perspective in the Picture, as any Parallel on the Ground-plane is to its Perspective in the same Picture, supposing the perpendicular and Parallel at the same Distance from the Picture; whence it follows, that if the perpendicular and the parallel are both of the same Length, their Perspectives in the Picture will be of the same Length also. And this is a Property of no small Use in the Practice of Perspective; for the

B Length

The T H E O R Y

Length of any original Parallel or Perpendicular being known, it will be easy by the Help of a Sector to give any part of a Senographick Projection its Due Dimensions in any Situation upon the Table.

Again, if from any Point S, in the Line SF considered as the Place of the Eye, Rays, as SpB, SqA be drawn to the Extremities of the perpendicular AB, because AB is to pq, as SB is to Sp, that is, as SB is to Sb, that is, as AB is to ab, it follows that pq, and ab are equal: Wherefore the Distance of the Object and the Eye from the Table, continuing the same the Perspectives of the same Perpendiculars, are equal to each other, whether the Eye be placed at a greater or less Height above the Horizon.

P R O B L E M I.

To find the Seat in the Perspective Table of any given Point in the Original or Ground-plane, the Height of the Eye, its Distance from the Picture, and the Distance of the original Point from the Table being given.

Let NMOP, See Fig. 9. represent the Table, S the Place of the Eye, SF, its Height above the Ground-plane CDKR, SE its Distance from the Picture, Q the original Point in the horizontal Plane CDKR, and AQ its Distance from the Perspective Table.

From S draw the Line SE, parallel to the Horizon or perpendicular to the Table to cut the Table in the Point E, the Visual Point in the Table, and from Q, draw the Line QA perpendicular to the Picture MNOP, to cut the Ground-line in the Point A, the Point of Incidence. Now if a Plane as STFQ, be imagined to pass through the Lines, ST, FQ, it will cut the Perspective Table in the Line EA their common Intersection; and in this Line of the Table will the Perspective of the Point Q be found, and consequently in the Point q the Intersection of the Diagonal SQ drawn from S, the Point of Sight, to Q, the given Point on the Ground-plane. Let us now imagine the Plane of the Perspective Table to revolve about the Line EA, the common Intersection of the two Planes till it coincide with the Plane STQF, as in Fig. 10. then will the Point Q in the horizontal Table coincide with the Point Q in the Ground-line, the Point S or Seat of the Eye in the Plane STQF will coincide with the Point S in the horizontal Line of the Perspective Table, and at the same Distance from the Visual Point E, as it was from the Perspective Table: In Fig. 9. in the like Manner, the Distance of the Point Q, in the Ground-line OP will be as far distant from its Point of Incidence A, as it was in the horizontal Plane from the same Point A, for by this Revolution of the Plane of the Perspective Table, the Points S and Q revolve about the Centers E and A, and consequently always keep the same Distance from them, but the Line EA, the common Intersection of the two Planes MNOP, and STQF becoming now the Axis about which the Plane of the Table revolves remains the same and immoveable, and consequently the Seat of the Point Q in the Perspective Table, remains in the same Place as at first before the Plane was supposed to revolve, and is therefore the true Perspective Place upon the Table, which being allowed, we shall have this general Rule.

For finding the Seat in the Perspective Table of any Point in the horizontal Table. See Fig. 10. Namely,

1. From Q the given Point in the horizontal Table draw the Line Q A perpendicular to the Ground-line to cut it in the Point of Incidence A.

2. Set off the Distance A Q of the Point Q in the horizontal Line from the Ground-line O P, from its Point of Incidence A in the same Ground-line to Q.

3. From E, the Point of Sight, to A, the Point of Incidence, draw the Ray E A, and from S, the Point of Distance, to the Point Q in the Ground-line last found draw the Diagonal S Q, and where this intersects the Ray E A last drawn as in the Point q, it will give the Perspective in the Table of the given Point Q in the Ground-plane.

Now as every Line is bounded by Points, and every Surface by Lines, and every solid by Surfaces; hence we are taught how to draw the Representation of any given Object upon the Perspective Table. And indeed the Laws here laid down and demonstrated are so general, that whosoever understands them readily will see the Reason of every Step taken in drawing the Scenographick Representation of any original Object upon any Vertical Perspective Table.

T H E O R E M VI.

If the Perspective Table be inclined to the Plane of the Horizon at any given Angle, the Perspective of any original Line, that is parallel to the Ground-line, will in the Perspective Table be parallel to the Ground-line also.

Let M N O P, in Fig. 11. represent the Perspective Table inclined to the horizontal Plane C A B Q, at an Angle equal to M O A; let S be the Place of the Eye, and A B the Ground-line, whose Perspective is to be drawn, from S the Eye, let the Visual Rays S A, S B, be drawn to the Extremities A and B of the given Line A B, to cut the Perspective Table in the Points a and b; now if these Points a and b are connected together by a Right Line a b, I say, this Right Line a b, which is the Perspective of the original Line A B, will be parallel to the Ground-line O P.

Imagine a Plane as R A B T to pass through the given Line A B, and to be parallel to the Plane of the Table M N O P.

Now because the Lines a b and A B are the common Intersections of the parallel Planes M N O P, and R A B T by the Visual Plane S A B, they will be parallel to each other by the 5th Axiom; but the original Line A B is parallel to the Ground-line O P by Hypothesis, therefore a b its Perspective in the Table will be parallel to the same Ground-line O P also, by the 6th Axiom. w. w. d.

Hence it follows that all Lines whatsoever, that upon the Ground-plane are parallel to the Ground-line, their Perspectives upon the Picture will be Parallel to the Ground-line and to each other also.

T H E O R E M VII.

In any inclined Plane, the Perspective of any Line in the original Plane, that, being produced, will cut the Ground-line at oblique Angles, will be found in that Right Line that is drawn from the Point of Incidence P. See Fig. 12. to the Point A in the horizontal Line of the Table, which is found by drawing a Line as S A from the Seat of the Eye at S parallel to the original Line P R, till it intersect the horizontal Line of the Table M N.

Because the Lines S A and P R are parallel by Hypothesis, and A P a right Line intersecting them both, therefore a Plane as S P R A will pass through them all, and therefore the Perspective of the Point R will be found in the Table in the Point r, the Intersection of the Diagonal S R, with the Line A P, the common Intersection of the Plane of the Table M N O P, and the Plane A S P R, consequently wheresoever the Point R be taken in the right Line P R, its Perspective will be found somewhere in the Line A P, and consequently the Line A P in the Table will be the Perspective of the Line P R indefinitely produced, so that in whatsoever Part of the horizontal Plane the Line P R be taken, provided it always forms the same Angle with the Ground-line, its Perspective upon the Table will be always found in that Right Line which connects its Point of Incidence P on the Ground-line with its accidental Point A in the horizontal Line.

If the Line P R cuts the Ground-line at right Angles, its parallel S A will intersect the Table in the Point of Sight E upon the Table; wherefore in inclined Planes as well as vertical Planes, as all Lines, that are perpendicular to the Ground-line in the horizontal Plane, when drawn on the Perspective Table, do run up and unite in the Point of Sight, so all other Lines in the Ground-plane that cut the Ground-line when produced at unequal Angles, will if they are parallel to each other when projected on the Perspective Table run up and unite in one common Point; whence it follows that the Height of the Eye and its Distance from the inclined Table being known or given, the Perspective Representation of any original Ground-plane is drawn on the inclined Table by the same Method, and after the same manner as it is done upon Vertical Tables. Let it therefore be required in,

P R O B L E M II.

To find the Length of the principal Ray intercepted between the Point of Sight and the Ground-line, or which is the same Thing, the Height of the Eye in the inclined Table and its Distance from the Table, the perpendicular Height of the Eye above the Horizon, and the Inclination of the Perspective Table being given.

Let O P, see Fig. 13. represent the Ground-line, F Q C a Line drawn at right Angles to it, S the Seat of the Eye, S F its perpendicular Height above the Ground-plane, and Q E the inclined Plane forming an Angle with the horizontal Plane equal to the Angle E Q C.

From Q the Point of Incidence of the Line E Q in the Ground-line, draw A Q perpendicular to the Ground-plane, and through S the Seat of the Eye draw S A E parallel to the Line F C to intersect the Line Q E in E, then will E be the Point of Sight in the inclined Plane, Q E the Height of the Eye, and S E the Space between the Visual Point E and the Point of Distance S, whence the Perspective of any Ground Plot may be drawn on that Plane.

THEOREM VIII.

In any inclined Plane, as M N O P, *See Fig. 14.* if from E the Point of Sight through the Point b, where the Base F B of the Eye's perpendicular Height S F cuts the Ground-line of the Table, a Line as E b be drawn and produced till it cut S F, the Line drawn from the Eye at S perpendicular to the horizontal Plane C Q O P produced downwards in the Point D, I say the Perspective of every Line perpendicular to the horizontal Plane, will be found in that right Line in the Table that is drawn from the Point D through the Point of Incidence made by a perpendicular drawn from the Base of the elevated Line on the horizontal Plane to the Ground-line of the inclined Table.

Let M N O P be the inclined Perspective Table, O P its Ground-line, where it intersects the Ground-plane C R T Q, S the Seat of the Eye, S F its perpendicular Height, E the Point of Sight in the Table, A B a Line perpendicular to the Ground-plane, whose Point of Incidence b is coincident with the Foot b of the principal Ray E b drawn on the Table; now if the Lines S F and E b are produced till they intersect each other in the Point D, I say, that if from this Point D through any other Point of Incidence as x in the Ground-line, a right Line as D x z be drawn the Perspective of the Line Z X erected perpendicularly over the horizontal Plane, which Point of Incidence in the Ground-line is x, shall be found in this Line z x in the Table.

Because the Lines S F D and A B W, are parallel by Hypothesis, a Plane as S A B W D F will pass through them, and because the Eye is seated in this Plane in the Point S, the Perspective of the Line A B will be found upon the Table in the Line E D, the common Intersection of the two Planes, which Line produced must necessarily cut the perpendicular S F, produced downwards in the Point D, since they all lye in the same Plane. S Y W D.

Now if from this Point D a Line as D x be drawn through x, the Point of Incidence of the Line Z X erected perpendicular over the horizontal Plane C R T Q, I say the Perspective of this Line Z X will be found in the Line D z x.

For because the Lines S D and Z X are parallel by Hypothesis, a Plane as S Z X D will pass through them both; and because the Eye is seated in this Plane at S, the Perspective of the Line Z X will be found on the Table in the Line x z, the common Intersection of the two Planes, which being produced must necessarily cut the Line S D in the Point D, the Intersection of the same Line S D with the Plane of the inclined Table produced, whence the Perspectives of the Lines A B and Z X on the Table will be the Lines a w and z q, intercepted between the Rays S A, S Z, S X, and S B flowing from the Eye to the Top and Bottom of the given Perpendiculars A B, and Z X.

And

The T H E O R Y

And after the same manner may the Perspective of any other Line elevated perpendicularly over the horizontal Plane be drawn on the Table.

For if we imagine a Plane to pass through the Line S D perpendicular to the horizontal Plane indefinitely extended, and at the same Time conceive this Plane to revolve about the Line S D as an Axis, it will during the Course of this Revolution pass through every Line that stands perpendicular to the horizontal Plane, and the successive Intersections of this Plane with the Plane of the Table will be the successive Perspectives of the several Perpendiculars it shall happen to pass through, and as all these Lines must necessarily center in the immovable Point D, as being common to every Situation of the revolving Plane, it must necessary follow, the Eye remaining also immovable, that the Perspective of every Line, that is perpendicular to the Ground-plane, will be found in that Line in the Table which is produced by drawing a Line from this Point D, through the Point of Incidence in the Ground-line made by a Perpendicular drawn from the Base of the given elevated Line to the Ground-line of the inclined Table; which was to be demonstrated.

Hence and from the Rules demonstrated in *Theorem 6*, and *7*. the Practice of drawing the Perspective of Objects of any kind upon inclined Tables is easily deduced.

By viewing the Figure, it is evident that the greater the Inclination of the Plane, the lesser will be the Angle S D E, and the farther will the Point D be removed from the horizontal Plane C R T Q, till at last when the Plane becomes Vertical the Point of Intersection D vanishes, and the Lines E b D and S F D become parallel, whence, as has been proved in the 5th *Theorem*, it follows that all Lines that are perpendicular to the horizontal Plane will, when projected on the Table, be perpendicular to the Ground-line also.

Again, the farther the Point of Sight S is removed from the Table, the greater will be the Distance of the Point of Intersection D from the horizontal Plane C R T Q, till at last the Eye being supposed at an infinite Distance the Line S F D will be removed at an infinite Distance from the Picture, also the Point of Intersection D will vanish, and the Elevation of all Lines perpendicular to the horizontal Plane will become Perpendiculars to the horizontal Plane in the Table, which is the Foundation upon which the Military or Birds Perspective is founded.

Again, the lesser the Inclination of the Table M N O P, the nearer does the Point of Intersection D approach to the Point F in the horizontal Table, the Foot of the Eyes perpendicular, till at last when the inclined Plane M N O P coincides with the horizontal Table C R T Q, the Angle of Incidence vanishes, and the Point of Concourse D coincides with the Point F; whence it follows,

That in all horizontal or optical Projections, the Perspective of every Line, that is erected perpendicularly over the horizontal Table, will be found in that Line of the Table which is produced by drawing a Line from the Foot of the Eye perpendicular through the Base of the elevated Line; whence it follows that the Perspective of all Lines, that stand perpendicular upon the horizontal Plane, will if produced unite or center in one common Point, namely the Point where a Line let fall perpendicularly shall intersect the horizontal Table.

THEOREM

THEOREM IX.

If the Plane of any original Figure be parallel to the Table, its Perspective will be similar to its Original, alike, and alike situated.

Let S, see Fig. 15. be the Seat of the Eye, M N O P the Table, H I K L the Plane of the original Figure A B C D.

I say, if the Planes M N O P and H I K L are parallel, the Perspective Appearance a b c d upon the Table shall be similar to its original A B C D.

For from S the Point of Sight draw the Rays S a A, S b B, S c C, and S d D.

Because the Planes M N O P and H I K L are parallel, S A B is a Visual Plane intersecting them, therefore the common Intersections a b and A B will be parallel, therefore A B will be to a b as S B is to S b: And again, because S B C is a Visual Plane intersecting the same parallel Planes, therefore their common Intersections, namely the Lines B C and b c will be parallel, therefore B C will be to b c, as the same Ray S B is to the Ray S b, wherefore by Equality of Ratios a b will be to b c, as A B is to B C; after the same manner it may be proved that b c is to c d, as B C is to C D, and c d is to d a, as C D is to D A, whence the Perspective Figure a b c d is similar to its original A B C D which was to be proved; whence it follows, that the optical or horizontal Perspective of all Plane Figures that are parallel to the Table, will be similar to their Originals; that is, that the Perspective of square Figures parallel to the horizontal or perspective Table, will on the Table be square, also the Perspectives of Circles, will be Circles, of Hexagons, will be Hexagons, &c.

Whence and from the last Corollary of the preceding *Theorem*, the Reasons of all the Appearances in horizontal Perspective are manifest, and as all Shadows are nothing else but horizontal Projections of the several Objects, the Candle or luminous Body supplying the Place of the Eye; hence it follows that every horizontal Projection of any Object elevated above the Plane is the Projection of the Shadow of the same Object, and consequently the Rules given for forming of one will serve for forming the other. And inasmuch as the immense Distance of the Sun is infinite with regard to any terrestrial Object, hence it is that the Rays that flow from the Sun to form the solar Shadow are supposed to be parallel; and hence it is that every Orthographick Perspective of any Object elevated above the Plane of the Horizon, is the Projection of the Shadow of the same Body, and consequently in drawing of one, you draw the other also; and these several Shadows, when drawn upon the Scenographick Table according to the Rules of Scenographick Projection, will exhibit upon the same Table the Shadows of all Objects drawn upon the Picture.

Again, inasmuch as the Practice of horizontal Perspective proceeds after the same manner as does the Practice of Scenographick Projections, so in *Problem* the first, Page the 10th.

If we suppose the Eye in Figure 2. in S, the Point of Distance in that Case, and E A to be the Distance of the Eye from the given Object, the Demonstration for one will hold good for the other, and consequently in proving the Operation in one, you prove the Operation in the other also.

Though

Though my principal View in this Tract has been to render the Demonstrations plain and concise, and the Number of *Theorems* as few as possible, yet at the same Time I have endeavoured to make them so general, that I may venture to say there is scarce any Operation made use of in the Practice of the several Kinds of *Perspective* but what may be accounted for by some one or other of the preceding Laws; this together with the following Treatise, which I look upon as one of the best practical Books of its Size that has appeared in the *English* Language, will I hope make the Whole as compleat and useful a Piece as the narrow Bounds will admit of.

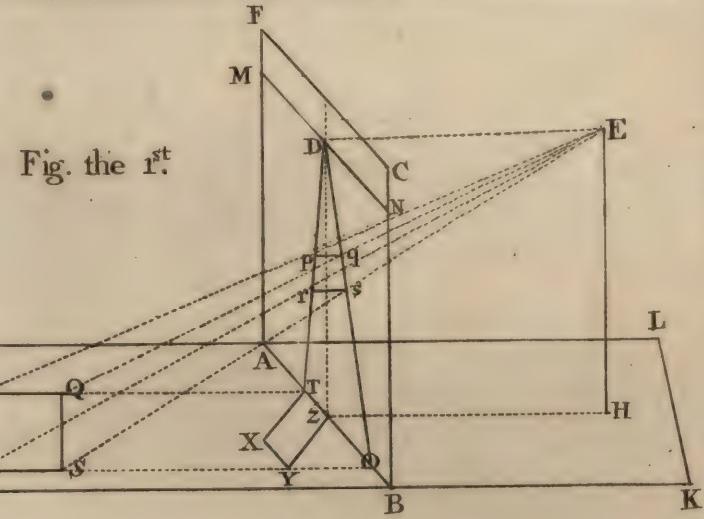


Fig. the 2^d.

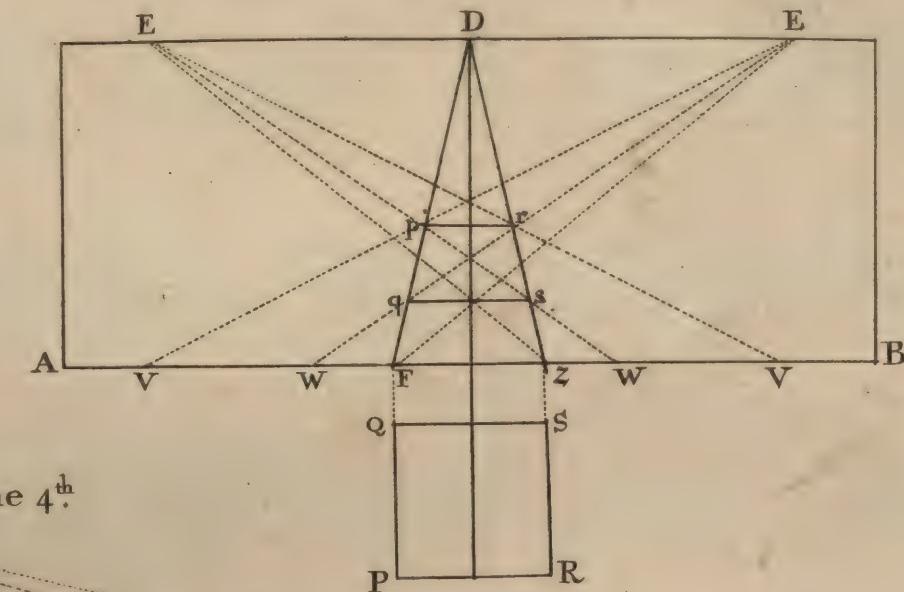


Fig. the 3^d.

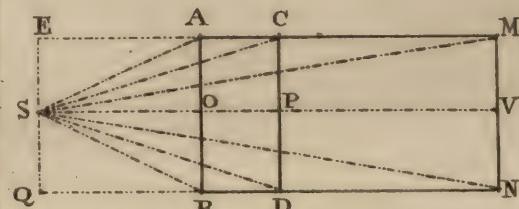


Fig. the 4th.

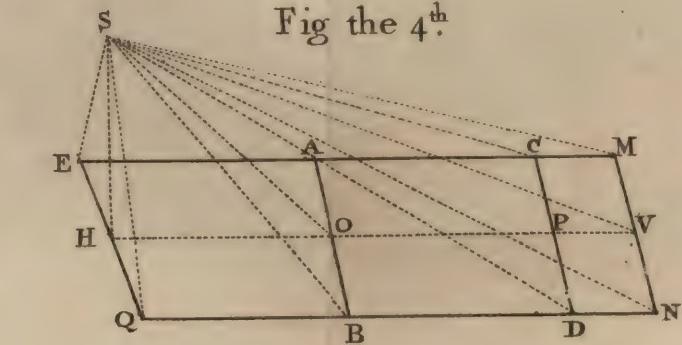


Fig. the 7th.

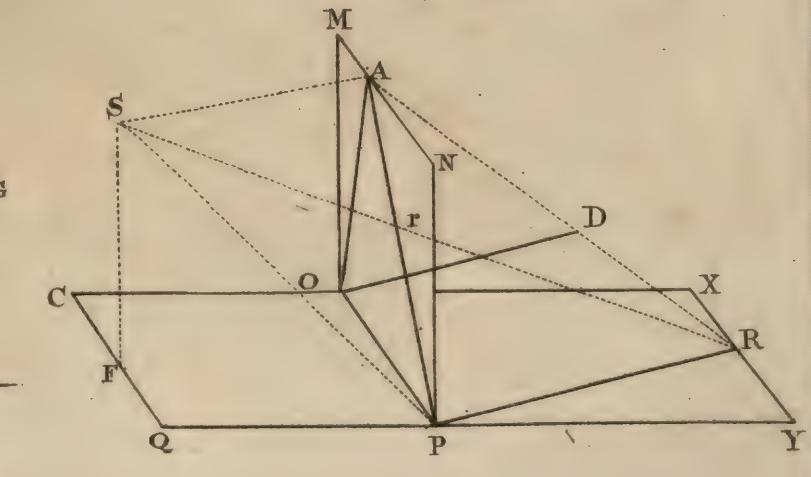


Fig. the 5th.

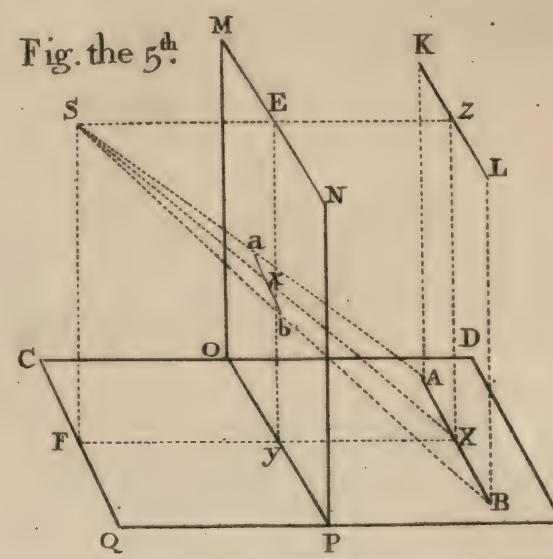
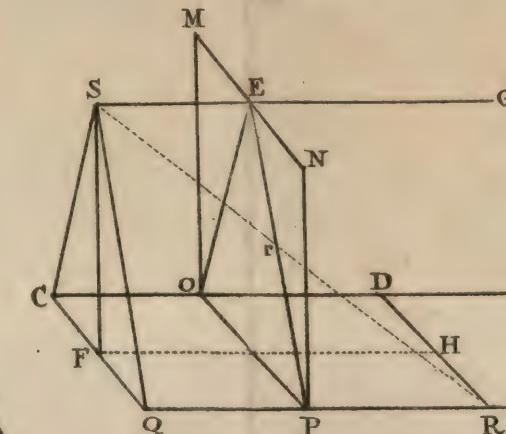


Fig. the 6th.



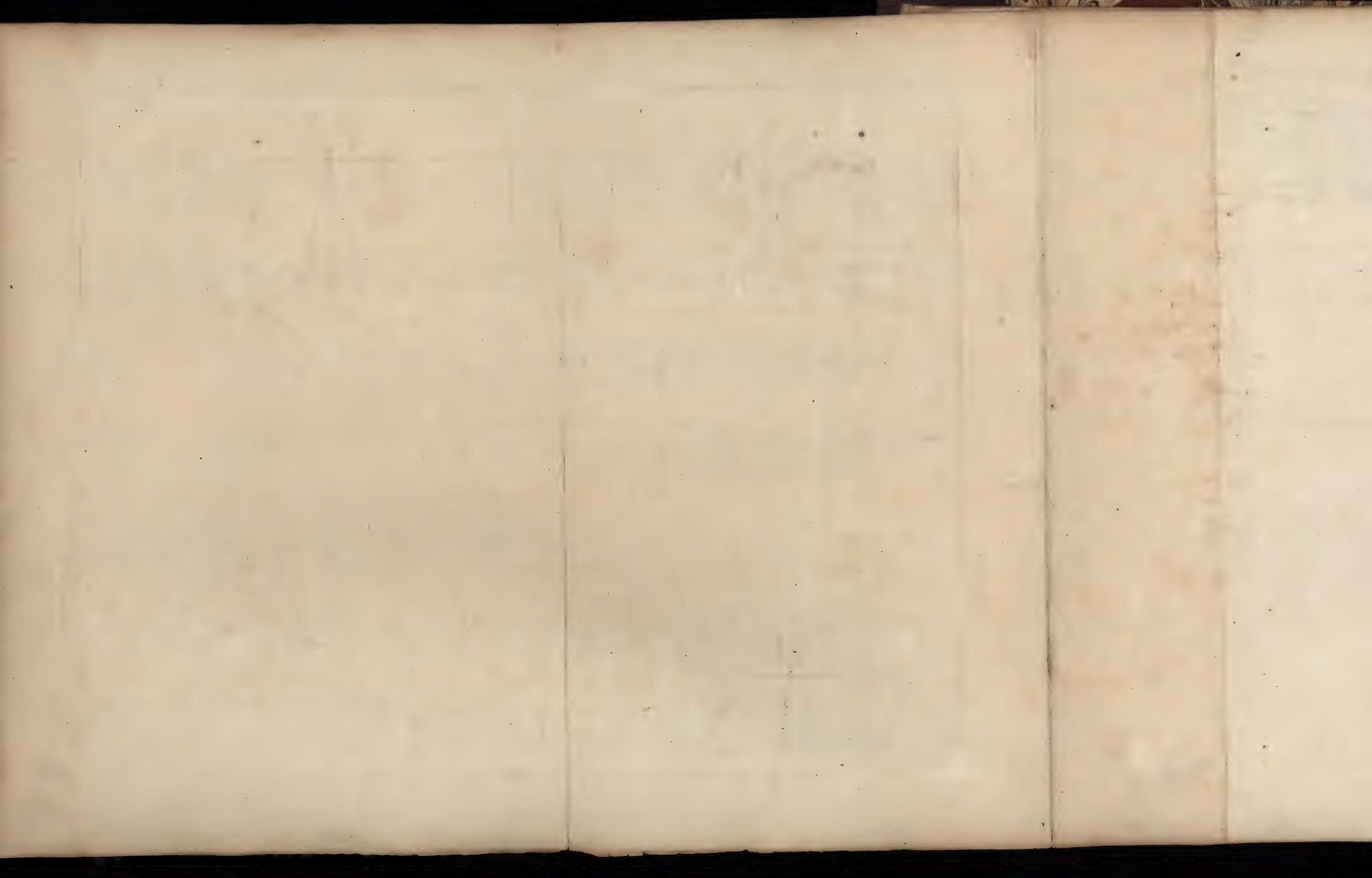


Fig. the 8th

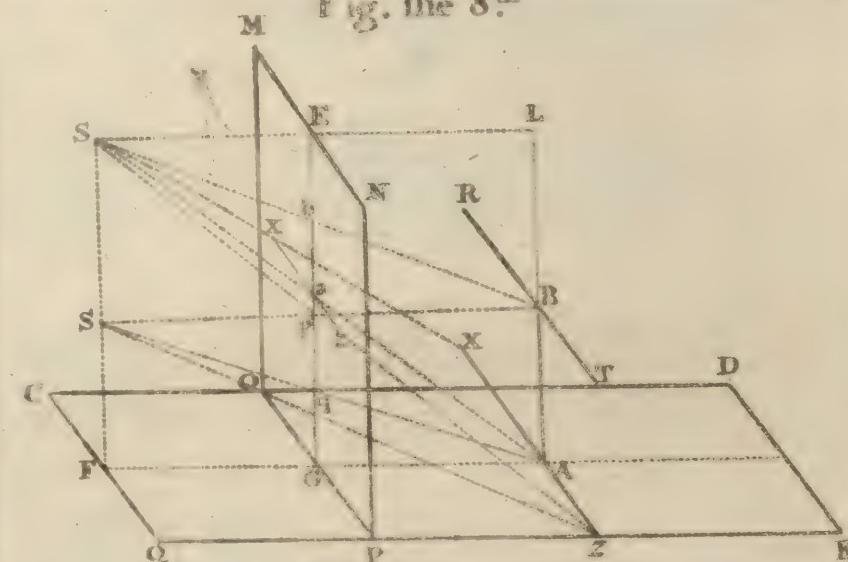


Fig. the 12th

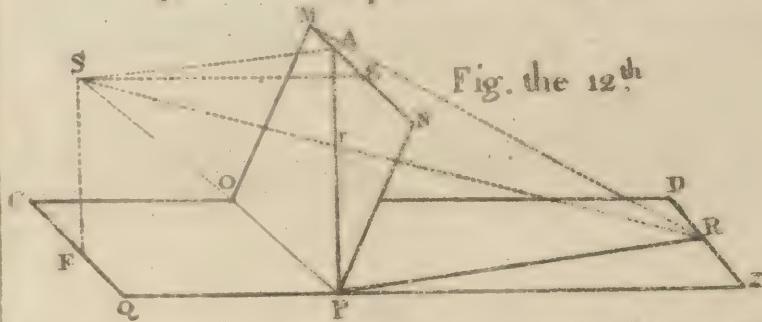


Fig. the 13th

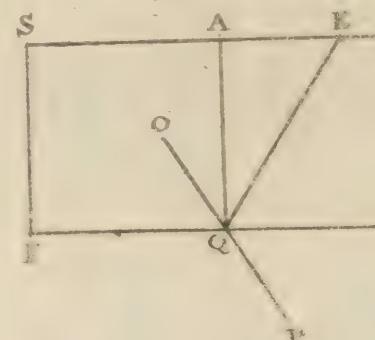


Fig. the 9th

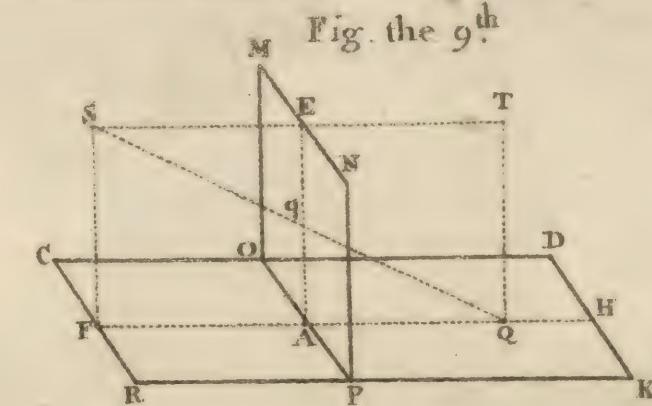


Fig. the 10th

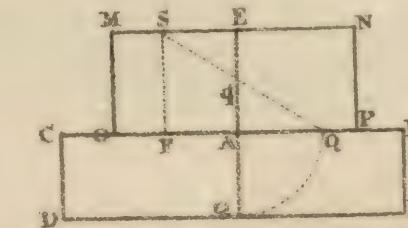


Fig. the 11th

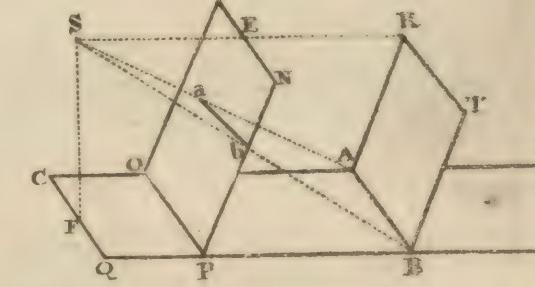


Fig. the 14th

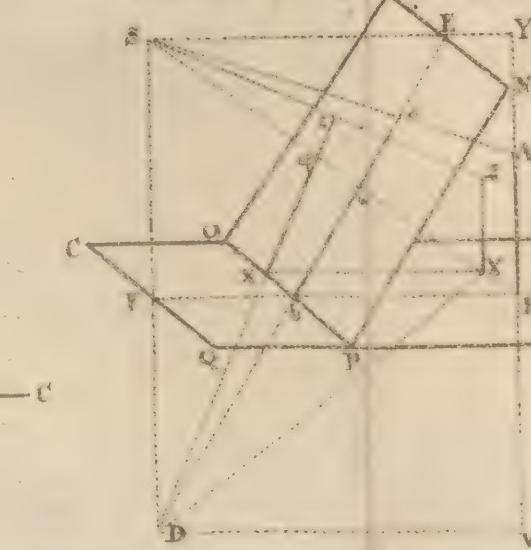
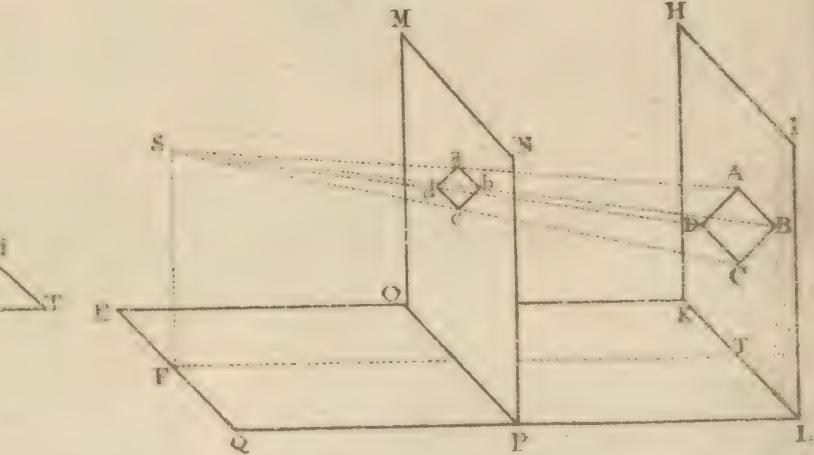
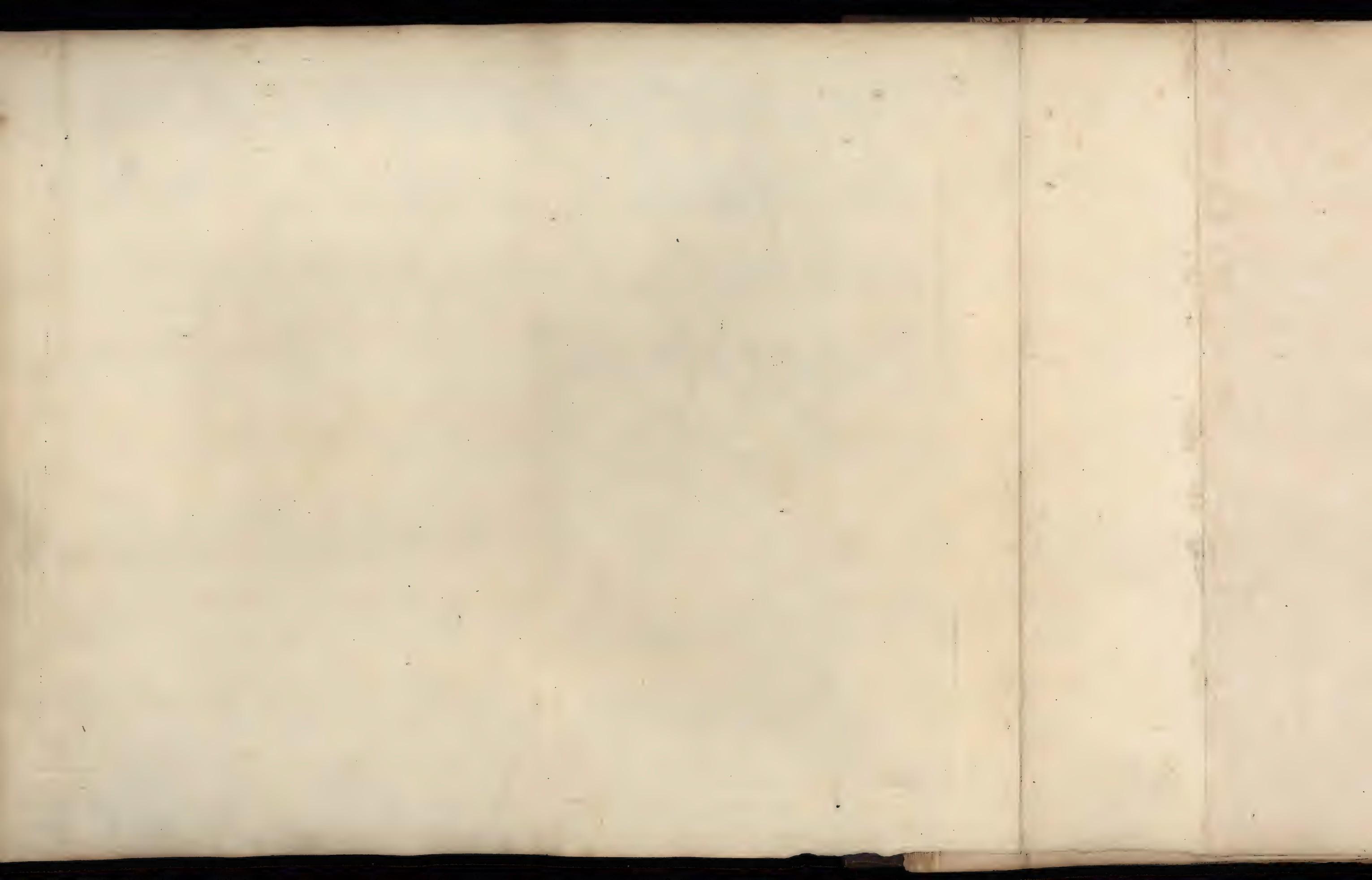


Fig. the 15th







SOME
DEFINITIONS
AND
PRINCIPLES
OF
PERSPECTIVE.



A

P E R S P E C T I V E

Definitions, Names and Terms of the Points, Lines and Figures used in the following Work.

A P O I N T is that which is conceived to have no Parts ; such as A, Fig. 1. There are three Kinds of Points used in Perspective, called *Points of Sight* or *View*, *Points of Distance*, and *Contingent or Accidental Points*.

A L I N E is a Length without Breadth ; such is A B, Fig. 2. There are five principal Lines used in Perspective, *viz.* 1. The *Line of the Base*, called also the *Line of the Plane*, or the *terrestrial Line*, as C D, Fig. 3. 2. The *perpendicular or plumb Line*, which, falling on another, makes the Angles on either Side equal : Such Angles are said to be *Right ones*, and the Line so falling on the other called a *Perpendicular thereto*. Thus, in Fig. 3. A B and E F, falling on C D, and making Right Angles in B and G, is a Perpendicular thereto. 3. The *parallel Lines*, which, being continued on the same Plane to Infinity, never meet ; as the Lines N and O, Fig. 6. The *horizontal Line* is no more than a Line drawn parallel to the *terrestrial Line* ; as we shall shew more amply in its Place. 4. The *Diagonal Line*, which is that drawn across a Figure, from one Angle to another ; such is K L, Fig. 10. 5. The *occult Line*, which is either drawn in Dots, or dry, and is supposed not to appear when the Work is finished ; such is O N, Fig. 2.

A R I G H T A N G L E we have already said to be that formed by a Perpendicular. 'Tis here represented a-part, by E F G, Fig. 4. to shew what it is the more distinctly. There are two other kinds of Angles, which comprise all those that are not Right ones : The first, called *obtuse*, are such as are greater than a Right Angle ; as H L M, Fig. 5. The other, *acute*, are less than a Right Angle ; such is H I K in the same Figure.

A T E R M is the Extreme of any Thing: Thus the Points A and B, Fig. 2. are the *Terms* of the Line A B.

A F I G U R E is comprehended under one or more Terms: Thus 7, 8, 9, 13, &c. are *Figures*.

A S Q U A R E has its four Sides equal, and its four Angles Right ; such is ABCD, Fig. 7.

A P A R A L L E L O G R A M, or long Square, has its four Angles Right, but not its Sides equal ; such is C D E F, Fig. 8.

A E Q U I L A T E R A L T R I A N G L E consists of three equal Sides ; as G H I, Fig. 9.

The **S E C T I O N** or **I N T E R S E C T I O N** of two Lines is when they run across, or cut each other in a Point, as in Fig. 11. where A B and C D cut or *intersect* in E.

A C U R V E L I N E is that which goes indirectly, or about, from one Point to another ; such is L M, Fig. 12.

A C I R C L E is a plain Figure, comprehended under one single Line, called the *Circumference*, to which all the Lines drawn from the Center are equal ; such is B C D, in Fig. 13. And the Point A in the Middle thereof is called the *Center*.

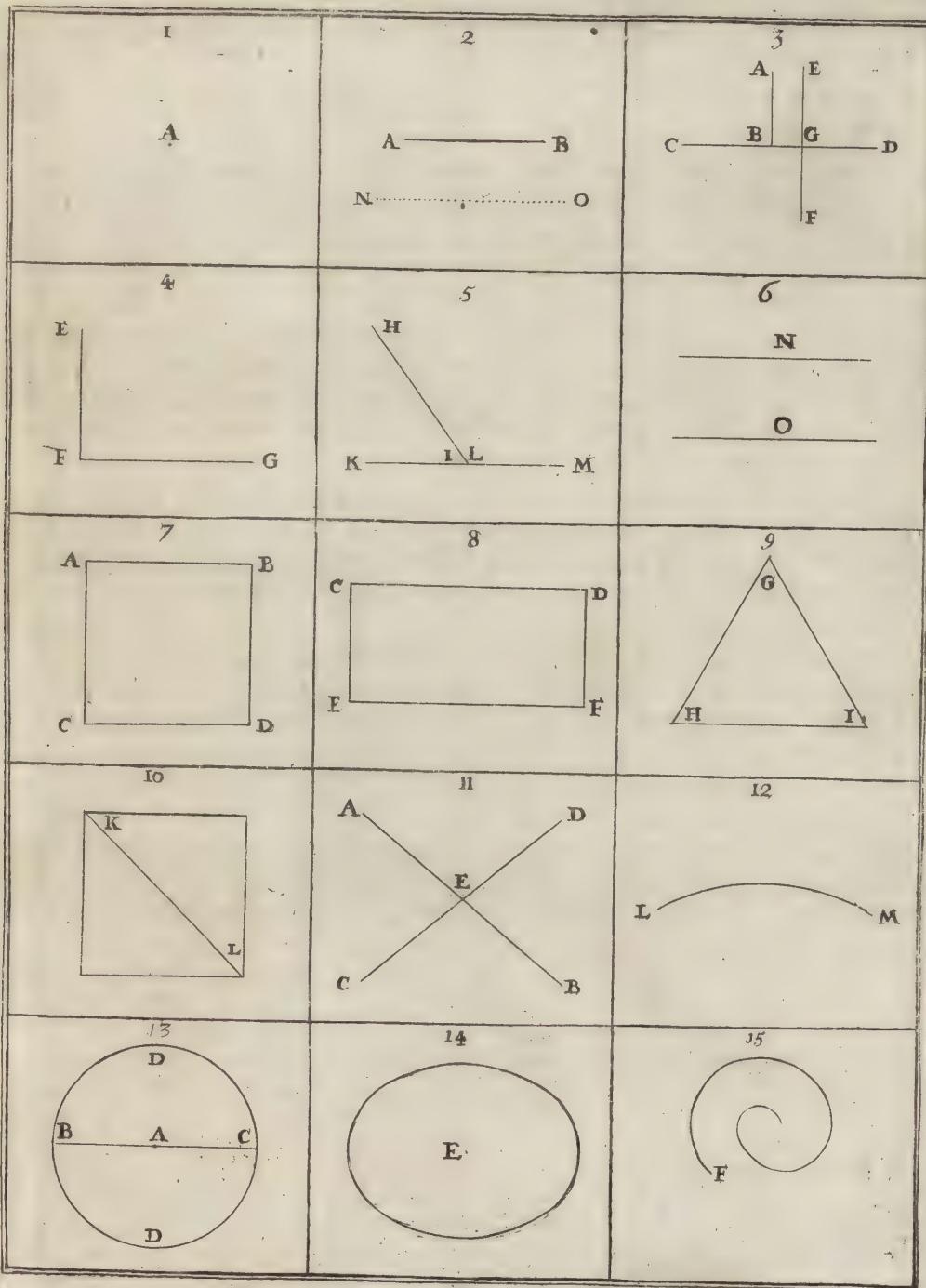
The **D I A M E T E R** of a Circle is a Right Line B C, passing through the Center A, and dividing the Circle into two Parts.

A O V A L, or **E L L Y P S I S**, is an oblong Figure, comprehended under one crooked, regular, but not circular, Line ; such is E, Fig. 14.

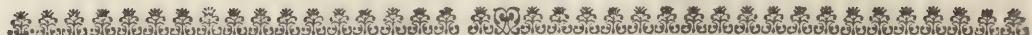
A S P I R A L, or **V O L U T E**, is a Line found by a Revolution about one or two Centers ; such is F, Fig. 15.

PRACTICAL.

I



1



SEQUEL of the Definitions, Names and Terms.

ATANGENT is a Line, which being produc'd only touches or razes an Object, Figure, or Line, without cutting it: Thus the Lines A B are *Tangents* to the Circle C, in the Points D D. We here add two kinds of Lines, which have the same Denominations as the former, and yet have different Effects, on account of the Point of View: For the Angle E A B is to be esteem'd a right Angle, and all the Lines C C C, &c. to be esteem'd as Perpendiculars to the Plane, as D F is; and the Lines A B, G I, and H K, as Perpendiculars to the terrestrial Line. All the Lines drawn to the Point of Sight, whether from above, or below, or from either side, are called RAYS, or VISUAL RAYS.

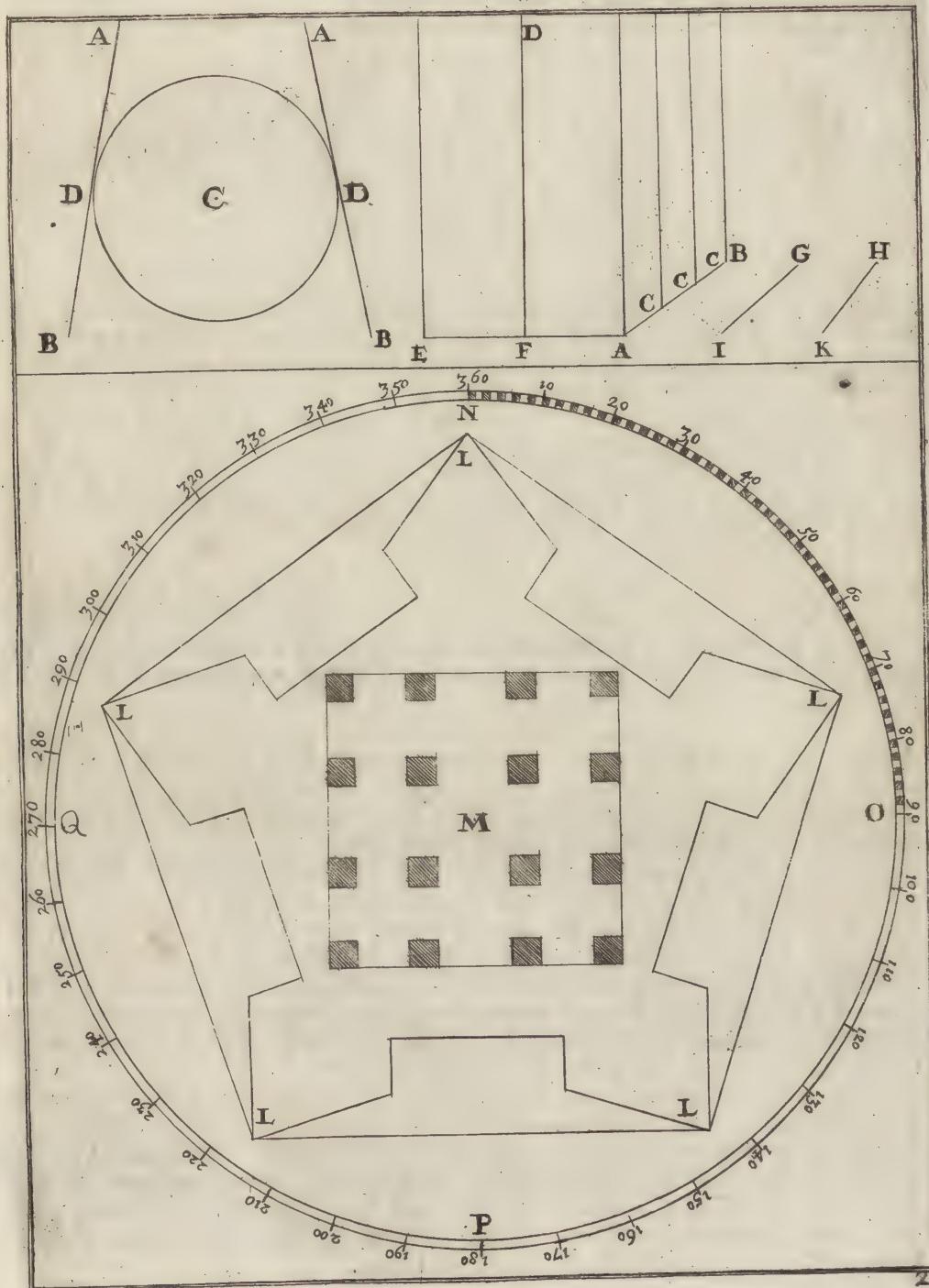
A PLAN, ICHNOGRAPHY, or GROUND-PLAT, is a first Draught or Design of a Thing, representing the Traces or Paths of its Foundation on the Ground, so as to exhibit the Correspondence, Situation, Distance, and Magnitude of the Parts, respectively, at one View. This is what we have represented in L and M.

A POLYGON is a Figure containing several Angles; as L.

A DEGREE is a little Arch or Portion of a Circle, whereof it contains 360. Each Degree the Astronomers subdivide into 60 Minutes, and each Minute into 60 Seconds, &c. But such Subdivision has no place here. 'Tis enough we know that Degrees are those little Divisions in the Circle N O P Q, whereby Angles are estimated. From them we derive an easy Method of making all sorts of Polygons, viz. by dividing 360 by the Number of Angles the Figures are to consist of. Thus, for Instance, if I would make a Square, I divide 360 by 4, the Quotient is 90, which gives the right Angle N M O: And so for the rest. Such as are unacquainted with Arithmetic, will find geometrical Methods of doing the same in Plate IV.

PRACTICAL.

2



P E R S P E C T I V E

Methods of Describing the Lines and Figures above defined.

1. *To raise Perpendiculars*: If it be in the Middle of a Line that a Perpendicular is required, open the Compasses to more than half the Length of the Line, and setting one Foot in the Point A, Fig. 1. with the other strike little Arches both above and below, as F and F: The like do for the Point E, and the two Intersections of those Arches will give a Perpendicular to the Line A E.

2. *If the Line be at the Top or Bottom of a Draught or Paper*, so that Arches cannot be struck both above and underneath, divide the Line into two, to get the Point G, Fig. 2. and, from the two Extremes of the Line, make Arches intersecting each other in H; then draw a Line from H to G.

3. *To raise a Perpendicular at the End of a Line*, as at the Point I, of the Line I K, Fig. 3. there are divers Methods: The first is that already delivered. But where room is wanting, one Leg of the Compasses is to be set in the Point I, and with the other a large Portion of a Circle L M is to be struck, and the Compasses, thus open, to be set on the Point M, and with the other Leg the Circle to be cut in the Point N, half the Arch M N being set off from M towards O, gives the Right Angle O I K: Or, without seeking for half the Arch M N, from the Point N, describe an Arch P Q; then, laying a Ruler over the Points M and N, draw a Line, cutting the Arch P Q in the Point P, and raise a Line from I to P; which is the Perpendicular required.

4. *Or thus*: If you would raise a Perpendicular from the Point P, Fig. 4. take a Point, at Pleasure, over the Line P S, as the Point Q, and from this Point describe a Circle passing thro' the Point P, and cutting the Line P S in some Place, as S; then from S draw a Line thro' Q to the Circumference of the Circle T, and the Point T gives the Extreme of the Perpendicular T P. A just Square shortens all these Operations.

5. *To let fall a Perpendicular from a given Point*: From the Point, as A, Fig. 5. describe the Arch B C, cutting the given Line E F in the Points G H, from which Points describe two little Arches above or below, cutting each other in the Point I; then, from the Point A let fall a Line thro' I to the Line E F, and it will be the Perpendicular of the given Point.

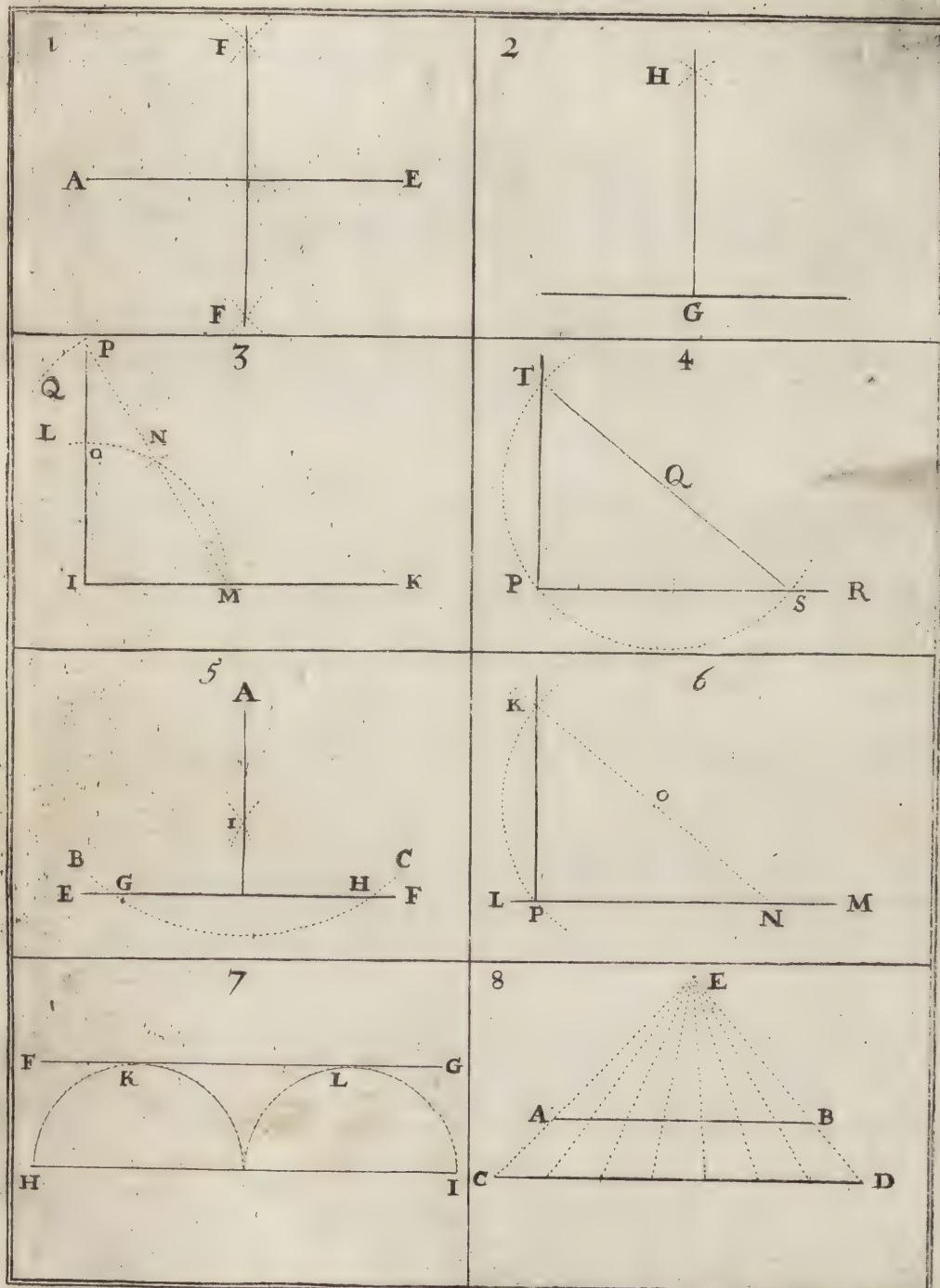
6. *From a Point given at the End of a Line to let fall a Perpendicular*: Suppose the given Point K, and the Line L M, Fig. 6. from K draw a traverse Line at Pleasure, cutting the Line L M in some Point, as N; divide the Line K N into two equal Parts, and, from the middle Point O, draw an Arch thro' K; and from the Point M, where it intersects the Line L M, draw the Perpendicular K P.

7. *A Parallel Line*, if truly drawn, will be a Tangent to Semi-circles drawn from Points assumed in the other Line: Thus F G, Fig. 7. is parallel to H I, because it only touches or razes the Semi-circles L and K.

8. *To divide a Line into equal Parts*: Suppose the Line be A B, draw another Parallel thereto, either above or below it, as C D; and on this last, which is either to be greater or less than that to be divided, set off as many Parts as A B is to be divided into, ex. gr. into seven; from the first and last of these Divisions draw Lines thro' the Extremes of A B, intersecting each other in some Point, as E; from which Point drawing Lines to all the Divisions of the Line C D, the Line A B will be divided into seven equal Parts.

PRACTICAL.

3



PERSPECTIVE

METHODS of Describing the Figures.

1. **A Line as A B, Fig. 1, being given to form a Square on,** set one Foot of the Compasses in the Point A, and extending the other the Length A B, describe the Arch B C; then from the Point B describe another Arch A D, intersecting the former in E, and from E set off half the Arch E A, or E B outwardly, to D and C; to which Points drawing Lines from A, B, &c. the Square is form'd.

Or thus. Upon the given Line A B erect a Perpendicular A C equal to A B; then, taking the Length A B in your Compasses, set one Foot in B, and with the other describe an Arch: The like being done from the Point C, the Interfection of the two Arches will be the Point D, which gives the Square ABCD.

2. *To describe a Parallelogram, or long Square, on the Term E, of the given Line E F, erect a Perpendicular either greater or less than the same, as E G; then taking E G in your Compasses, set one Foot in F, and with the other describe an Arch; take also E F in your Compasses, and setting one Foot in G, describe a second Arch, cutting the former in H: This will give you the Parallelogram requir'd.*

Of Circular Polygons, which are Figures of several Angles inscribed in Circles.

3. *To describe an equilateral Triangle:* The Compasses being open to the Radius of the Circle, set one Foot in the Point A, describe the Arch D E, and draw a right Line D E, which will be the Side of the Triangle D E F.

4. *For a Square,* draw two Diameters at right Angles, and join their Extremes; thus you will have the Square A B C D.

5. *For a Pentagon, or Five Angle,* draw two Diameters, and take D G, half the Semi-diameter D I, and from the Point G, with the Interval G A, describe the Arch A H; the Chord of which is the Side of the Pentagon.

6. *For the Hexagon, or Six-Angle,* the Semi-diameter is the Side of the Hexagon.

7. *For the Heptagon, or Sept Angle,* take half a Side of the equilateral Triangle.

8. *For the Octagon, or Eight-Angle,* take half a Quadrant of the Circle

9. *For the Enneagon, or Nine-Angle,* take two thirds of the Semi-diameter for the Side; as E B.

10. *For the Decagon, or Ten-Angle,* divide the Semi-diameter into two in the Point G, and from G, with the Interval G A, describe an Arch A B; the Part of the Diameter B C will be the Side of the Decagon.

11. *For the Undecagon, or Eleven-Angle,* draw two Diameters at right Angles, and from the Point A, with the Interval of a Semi-diameter, describe an Arch B C; then from the Point of Interfection C, draw a Line to E; the Portion C D will be the Side of the Undecagon.

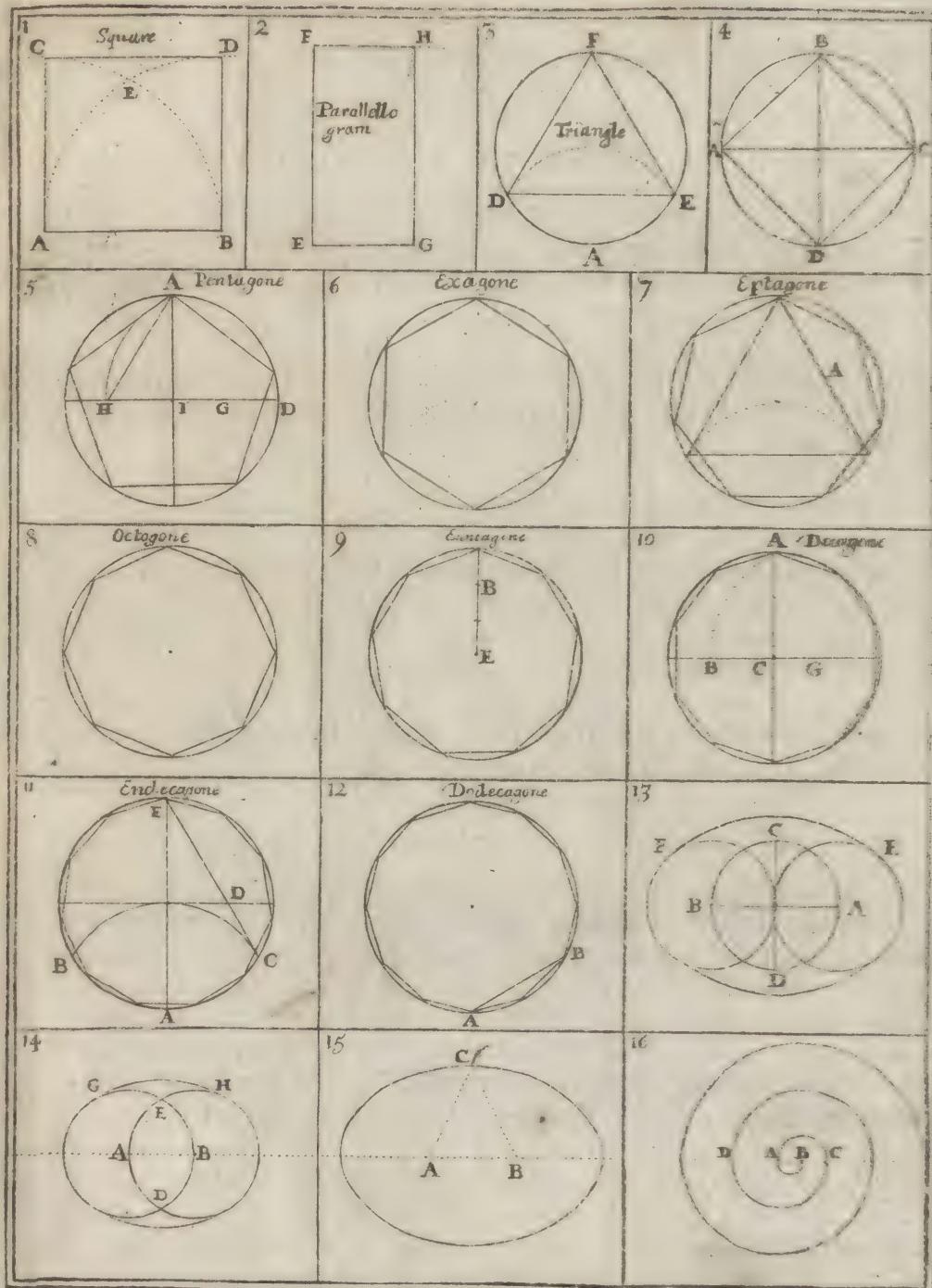
12. *Dodecagon, or Twelve-Angle,* divide the Arch of a Hexagon, A B, into two equal Parts; the Chord of the Moiety will be the Side.

13. *An Oval* is formed divers ways; in all which the Figure is either a compound of several Portions of Circles, or it is one Line drawn from two Centres. The most usual Methods are these: Having described a Circle, and drawn two Diameters therein, as A B C D, from the Points A B we draw two other Circles equal with the first; then from the Point D we draw a Line through the Center of the last Circle to the Circumference E: This done, setting one Foot of the Compasses in D, and with the other taking the Interval E, we describe an Arch E F. The like being done on the other Side, the Oval is formed.

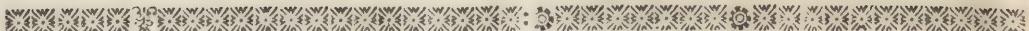
14. *For a rounder Oval,* draw a single Line, and from A, as a Center, describe a Circle, the Interfection whereof with the right Line in the Point B, will be the Center of another Circle. Now, to form the Oval, take in your Compasses the whole Diameter of one of the Circles, as from A to F, and in one of the Intersections of the Circles, as D, setting one Foot of the Compasses, with the other draw the Arch G H: The like do from the Point E.

15. Otherwise we have an easier and more useful manner of describing Ovals than any of the preceding ones; the same Rule serving for all Forms, long, narrow, broad, short, &c. Thus: Set two Nails or Pins in a right Line A B, to serve as a Center, and about these tie a Thread of the Length and Width of the Oval required, as A B C; hold the Thread tight with a Pen or Pencil, and turn it about till you arrive where you began. If you require it a long one, set the Centers the farther apart; and observe the contrary for a short one: For if the Nails stand close together, the Figure will be a Circle.

16. *For a Spiral, or Volute,* take two Points in a Line A B; the Points to serve, one after another, as Centers. For instance, having drawn the Semi-circle A B, set one Foot of the Compasses in B, and open the other to the Length B A, and describe a Semi-circle A C; then setting one Foot in A, take the Interval A C, and draw the Semi-circle C D; and this continuing as long as you please, still shifting Centers. *Vignola* gives us another Method.



B



Of the VISUAL RAYS.

IF an Object be a single Point, it sends only one visual Ray to the Center of the Eye; and that Ray is called the *Axis*, or *Central Ray*, as being the most vivid of all Rays: Such is A B.

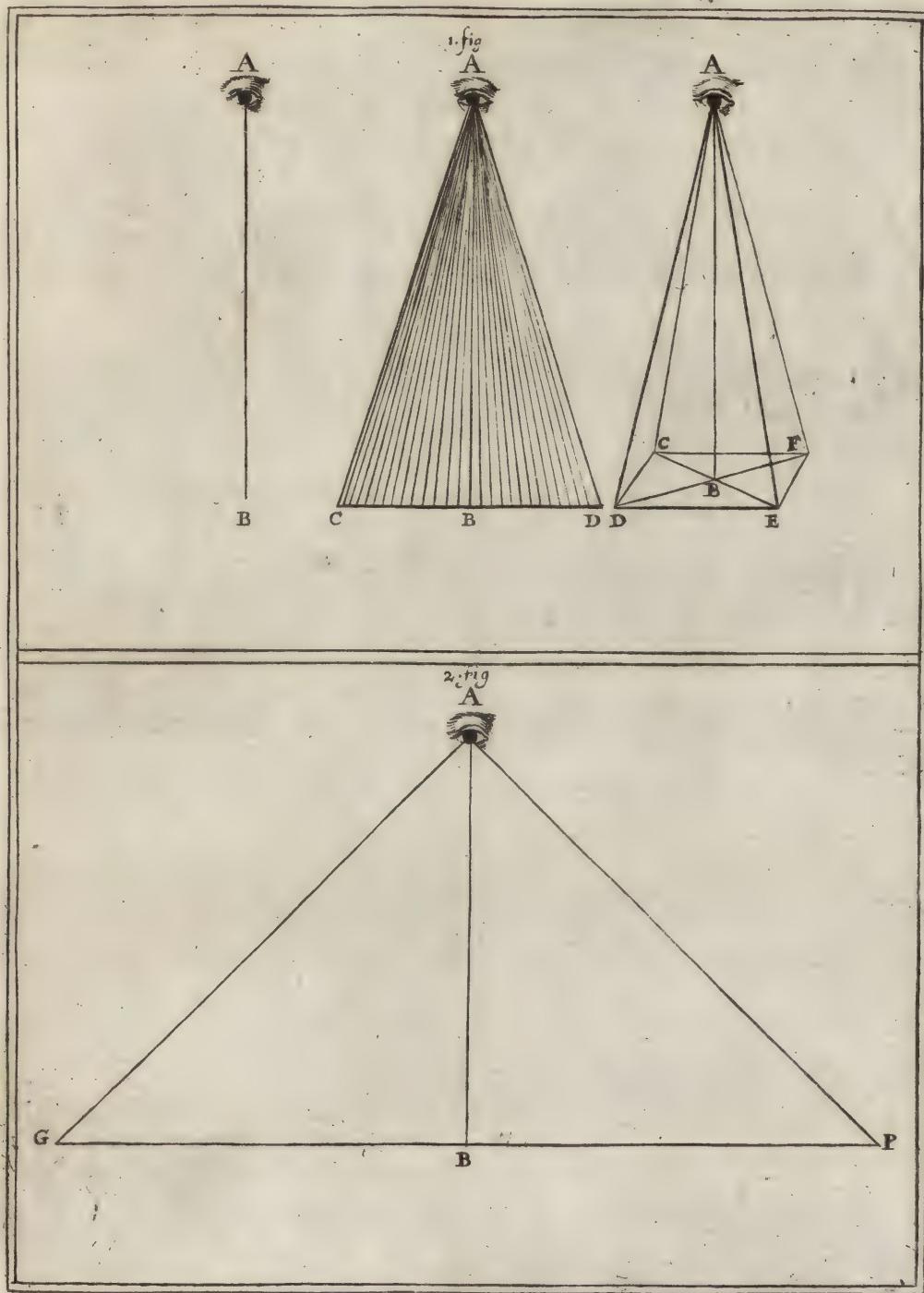
If the Object be a right Line, the visual Rays form a Triangle, as C A D, whose Base is the Line C D, and Sides the two extreme Rays A D and A C; A B is the central Ray. If the Line were seen end-wise, it would appear as a Point.

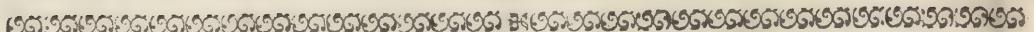
If the Object be a Surface, whether plane or spherical, the visual Rays will make a Pyramid, whose Basis is the Object C D E F, and its Vertex the Eye A. The rest of the Pyramid consists of visual Rays; in which Number the Central A B is the strongest, the others being all weaker, as they are farther therefrom, though they still retain a competent Strength, till they make a right-angled Triangle. Such as go beyond this, become so feeble, that they appear very confusedly. So that to have distinct Vision, the extreme Rays under which the Object is comprehended, must, at most, subtend a right Angle in the Eye. If the Pyramid were viewed side-wise, it would appear no more than a Line.

Why a Piece of Perspective is seen better with one Eye than with two.

Some hold that all Objects appear better with one than both Eyes; al-ledging, that the Sight is render'd more penetrating by the visual Rays of the shut Eye being determined to the other; inasmuch as all Powers become more vigorous when united, than when dispersed. Accordingly, say they, one of the Eyes being closed, the whole visive Virtue before diffus'd thro' both, is now suppos'd to be collected into one; a Re-inforcement, must necessarily render it stronger, more piercing, &c. than both.

Be this as it will, 'tis certain, we see a Piece of perspective with one Eye better than with both. The reason is, that the central Ray, in the Case, is directed to the Point of Sight where all the Radials of the Piece do meet; which is what shews a Picture in its last Perfection. 'Tis for this reason that we don't say, *the Points of the Eyes*, but, *the Point of the Eye*, as insinuating, that Perspective is most pleasing, when viewed by a single Eye.





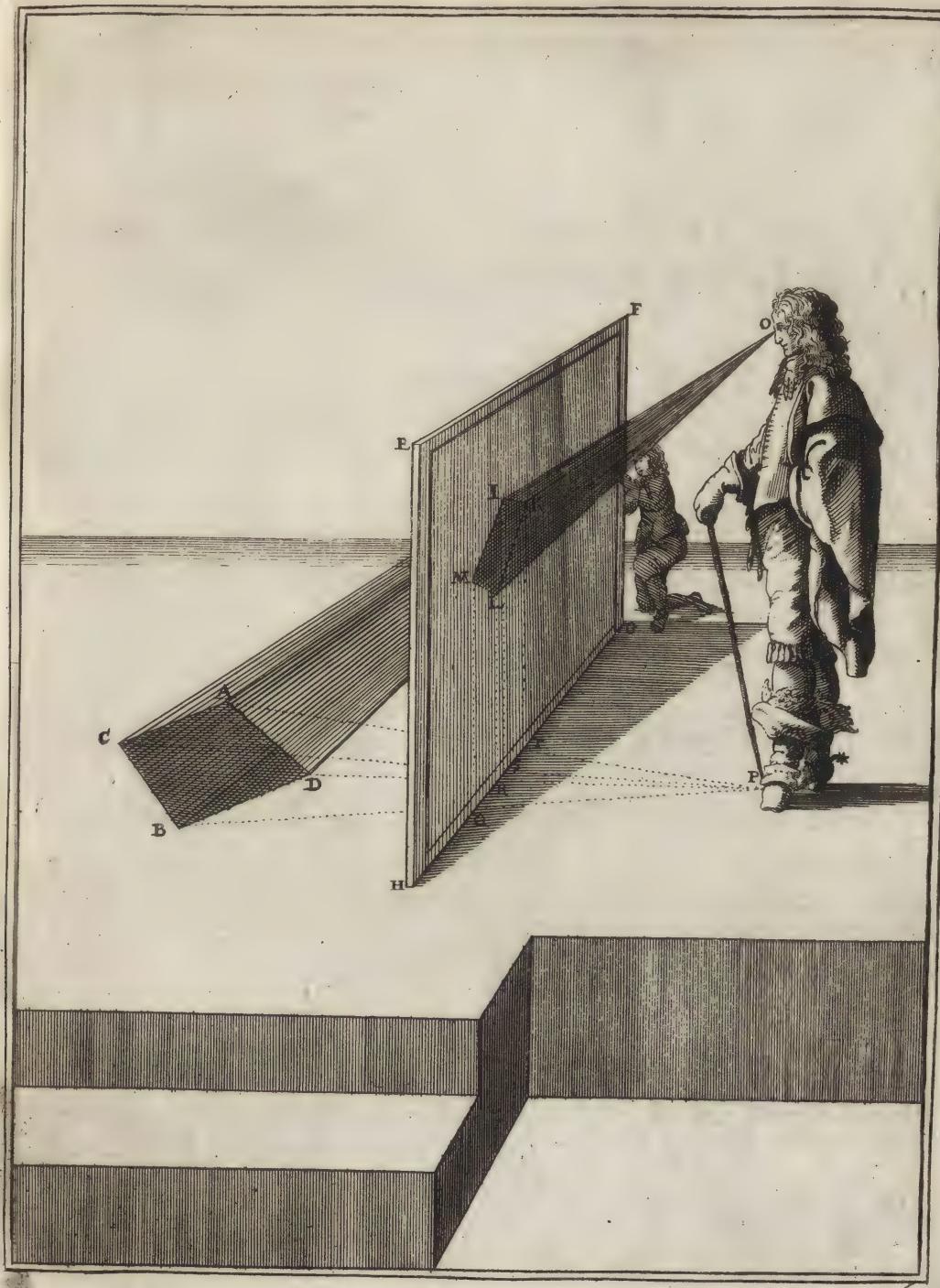
First DEFINITION.

PERSPECTIVE is the Art of representing Objects seen through some transparent Medium, which the visual Rays penetrate in passing from the several Points of the Object to the Eye. Accordingly, whatever is seen through any Thing, as through Air, Water, Clouds, Glafs, and the like, may be said to be seen in Perspective. And since we see nothing but through those Mediums, 'tis certain all we see is in Perspective.

The End of Perspective is to exhibit Objects upon a Plane, situate between the Eye and them, *ex. gr.* on the Plane E F G H, to represent the Objects A B C D, in the Points I K L M.

The better to conceive this, suppose an Object A B C D on the Ground, and a Spectator's Eye in O; if a transparent Body E F G H be placed between the two, the Intersections of the visual Rays, with the Perpendiculars Q R S T, will give the Figure I K L M, such as the Object appears on that Plane. Perspective, therefore, consists altogether in the Intersections of Lines: Whence it is, that Marolois always calls any Thing put in Perspective, the *Appearance of the Section*; since the Plane E F G H cuts the visual Pyramid A C B D and O, and gives I K L M for its Section.

The Reason of these Sections is, that one single Line determines nothing; but there are two required to cut one another, to give a Point. Now, as 'tis evident, that between our Eye and an Object, there is always a right Line, or Ray, that can never be wanting: But to get the other, which is to cut it, 'tis necessary we conceive, that from our Foot as a Center, there are a Number of Lines, or Rays, continually flowing to the Angles of the Objects we see; as from P to the Angles A B C D: All which Rays being cut by some transparent Plane, as E F G H, the Rays P B, P A, P C, P D, which before were horizontal, are now erected and become perpendicular: P B, for Instance, becoming Q M, P D becoming R L, &c. For if they continued horizontal, the visual Rays would never intersect them, till they both met in the Object itself. 'Tis for this Reason we always suppose a Plane, which, reflecting the Rays, gives them an Occasion of intersecting, and so of finding the Points to form the Appearances of Objects.



PERSPECTIVE



Second DEFINITION.

ICHNOGRAPHY is the Figure of the Platform, or the Plan of any thing is to be rais'd upon: Thus ABCD is the *Ichnography*, or Plan, of a square Body.

Third DEFINITION.

ORTHOGRAPHY is the Figure of the Front or Fore-side of an Object, as an House, &c. Or it is the Figure of an Object, as a House, &c. directly opposite to the Eye: Thus EFGH is the *Orthography*, or Fore-part, of a Cube, or House. As the *Ichnography* represents the Plan, the *Orthography* represents the Side opposite to the Eye.

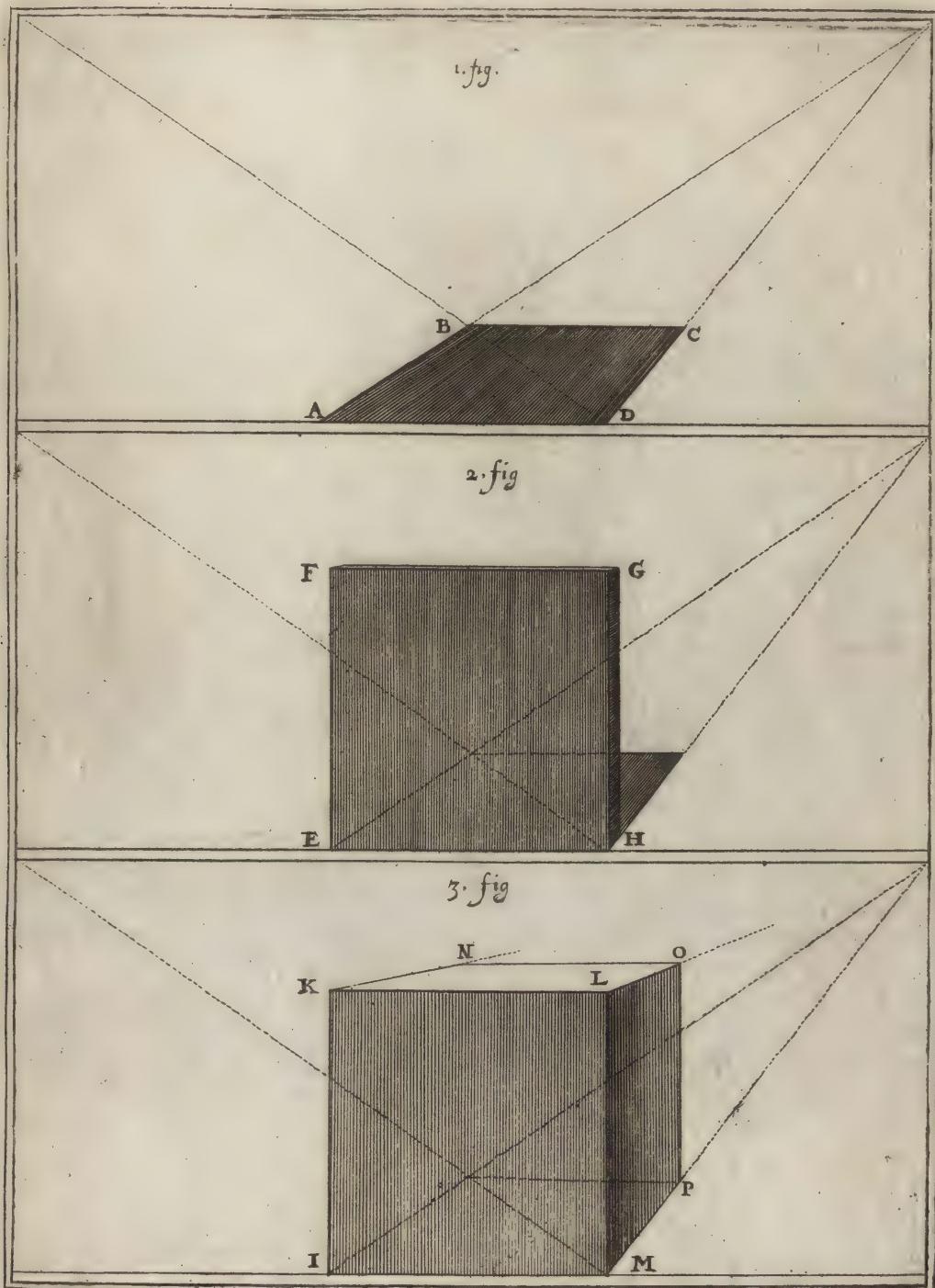
Fourth DEFINITION.

SCENOGRAPHY is what exhibits the Object quite rais'd, and perfect, with all its Diminutions and Shadows, both in Front, the Sides which may be seen, and the Top: Thus IKLMNOP is a *Scenography*, or perfect Cube. This is the whole, and comprehends all the others as Parts.

To render the Terms more familiar, we shall, for the future, call the *Ichnography* PLAN, the *Orthography* FRONT, and the *Scenography* ELEVATION.

PRACTICAL

7



Why Objects appear the nearer each other, as they are more remote from the Eye.

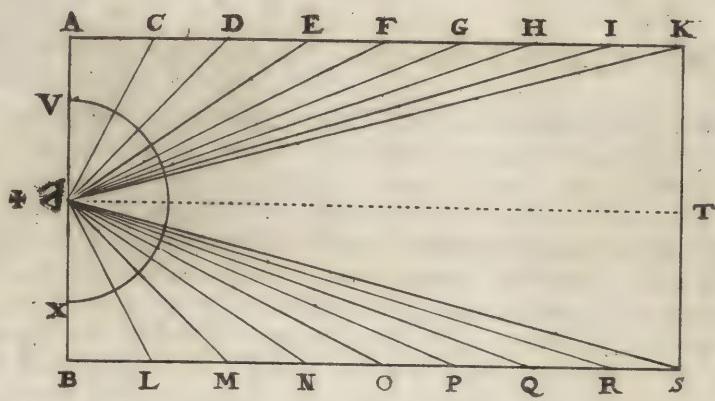
THIS Figure may help to solve a Question of some Difficulty: Suppose a Spectator's Eye in the Middle of a Line at \perp , 'tis evident, that if it would see the two Extremes thereof, A and B, it must take in a Semi-circle V X, whose Center is in the Eye itself, and whose central Ray is the Line \perp T. By taking in this Semi-circle, it will perceive the Objects on either Side, and in such manner, as that those farthest off from the Side A appear to approach towards the Center T, and those on the Side B seem to approach likewise.

Now 'tis asked, How Things so wide asunder should come to approach and join each other, and that whether situate side-wise or over one another?

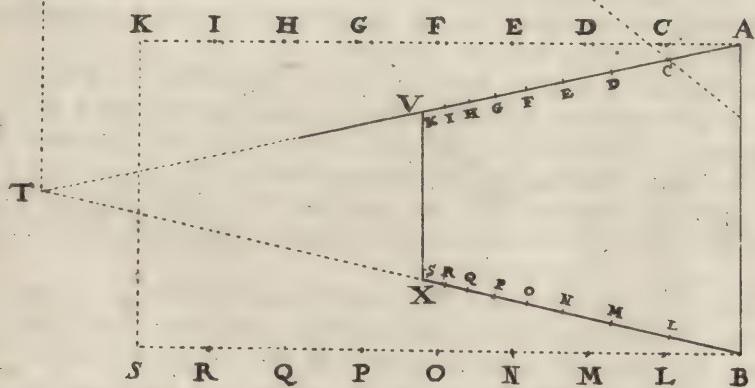
The Answer in few Words is this: All Objects appear under the visual Angle they subtend at the Eye. Now, be they Columns, Trees, Animals, or any other Things, placed on the Side of A, the remotest will seem to border on the Center T, by reason they are seen under an Angle, or Ray, that is near thereto. The Ray \perp K, for Instance, being much nearer the central Ray T, than is the Ray \perp C and \perp E, and of Consequence must appear to be there: Add, that if the Objects were prolonged to Infinity, they would still approach nearer the central Ray T, till such Time as they seemed contiguous therewith, and only to form one Point together.

Now, in Perspective, the Sides A K and B S don't continue parallel, but degenerate into visual Rays, intersecting each other in the Point of Sight, and by that Means giving the Diminutions of Objects. Thus, for Instance, in the second Figure, the Eye being at a Distance capable of seeing the Line A B, from the two Angles A B arise two Rays, which proceed to the Point of Sight T, which Rays A T and B T receive the Intersections the Point of Distance makes with the Objects, which all the while contract themselves proportionably; as will be shewn in its Place. By such Means the whole Parallelogram A K B S, and all the Objects on either Side become reduced into the narrow Compass A V, B X: And if the Eye were more remote, that Space would be still smaller, since the farther an Object is off, the smaller it appears, as we shall make appear in the following Page.

1. Fig.



2. Fig.



C

P E R S P E C T I V E



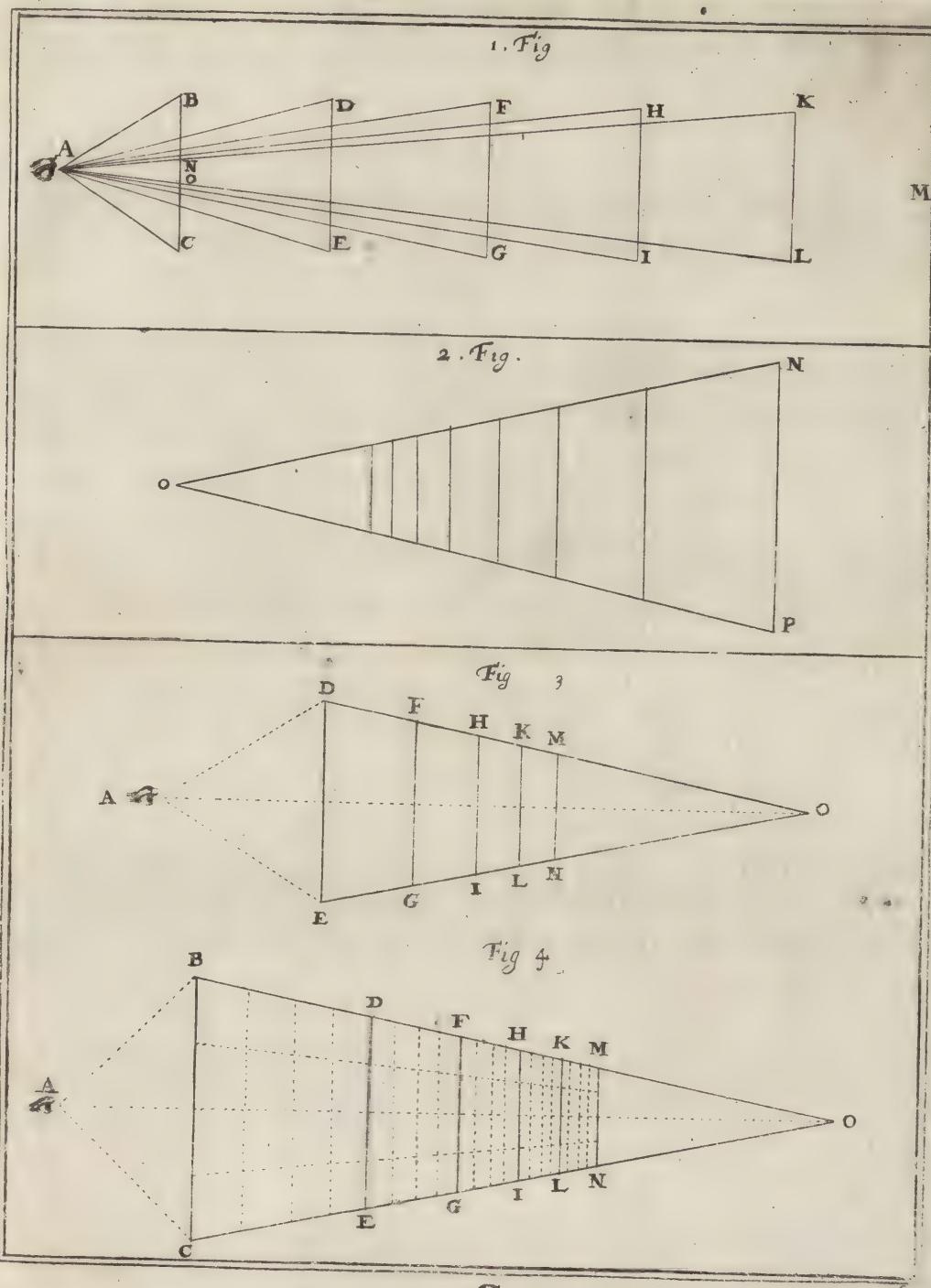
Why Objects appear the smaller as they are at the greater Distance.

WE have already observed, that Things appear according to the Angle wherein they are seen, and that this Angle is taken at the Eye, where the Lines terminating the Object, meet. The Eye A, for Instance, viewing the Object BC, will draw the Rays AB and AC, which give the Angle BAC; so that an Object viewed under a greater Angle will appear large, and another under a lesser Angle little. Now 'tis certain, that among equal Objects, those at the greatest Distance will appear under the smallest Angle; consequently in all Perspectives the remotest Objects must be made the smallest: For Example, if the Eye be in A, the Object BC, which is the nearest, will appear the biggest, because seen under the greatest Angle; and the second, third, fourth, and fifth Objects will all appear smaller and smaller, tho' really all equal, inasmuch as the Angles diminish in Proportion as the Objects recede. If the Eye were removed into M, KL would appear the largest; and BC, in this latter Case, no bigger than NO.

The second Figure is a Sequel of what we have advanced: For, supposing the Objects to appear such as is the Angle they are seen in, it follows, that if several Lines be drawn between the Sides of the same Triangle, they will all appear equal: Thus, all the Lines comprised between the Sides ON, OP, of the Triangle NOP, will appear equal to each other; and, as Objects comprehended under the same Angle seem equal, so all comprehended under a greater Angle, seem greater, and all under a smaller, smaller.

Thus much supposed: If there be a Number of Columns, or Pilasters, to be ranged in Perspective on each Side of a Hall or Church, they must of Necessity be all made under the same Angle, and all tend towards one common Point in the Horizon O: For Instance, the Eye being placed in A, viewing the first Object DE; if from the Points DE you draw the visual Rays DO, EO, they will make the Triangle DOE, which will include the Columns DE, FG, HI, KL, MN, so as they will all appear equal.

What we have said of the Sides, is likewise to be understood of the Cielings and Pavements; the Diminutions of the Angles of remote Objects, placed either above or below, following the same Rule as those placed laterally. We need not therefore add any Thing farther; unless, that Care be taken there be as many Squares or Divisions between the remotest Objects as between the nearest: For in that Case, tho' distant Objects be the closer as they are farther from us, they will appear in some Measure to preserve their Distance; thus, in BCDE, the Interval between the four nearest Columns, there are sixteen Squares, and no fewer than sixteen between the four remotest KL MN.





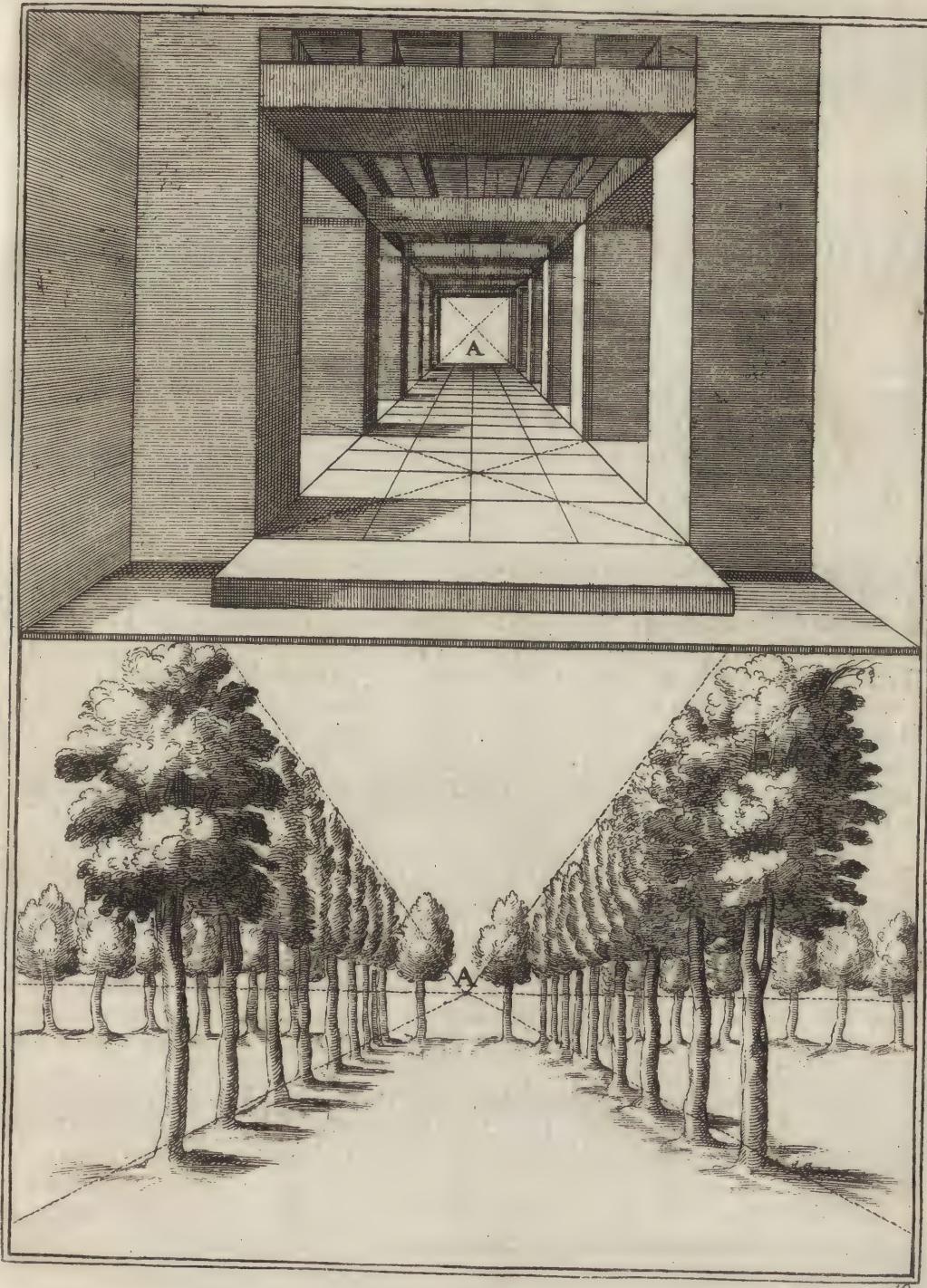
IT follows from what we have said, that if you join two Triangles, as in the last Figure but one, for the Sides, and two others, of the last, for the Tops and Bottoms of an Object, all four will terminate in one single Point A, which is the Point of Sight, wherein all the visual Rays meet. And this will give a Proof of what we have advanced, *viz.* That Objects diminish as they remove, the lower rising, the upper falling, and the lateral closing or approaching: An Example of all which we give in Fig. I. which exhibits, as it were, Depths and Distances falling back, and receding from us, though all equally near the Eye.

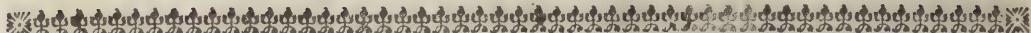
The Trees being ranged by the same Law, have the same Effect as the Columns, &c. For being all comprehended in the same Angle, and the two Rows having each its own Angle, and the Angles all meeting in a Point A, they form a third, which is the Earth, and a fourth, which, if you please, is the Air; and thus afford an elegant Object, highly entertaining the Eye.

We come now to shew how you are to proceed in putting any plane Body, or other Figure, in Perspective.

PRACTICAL.

10





Of the HORIZON.

WHAT we call the HORIZON, in Perspective, is only a Line given us by the Height of our Eye: Thus, if we be raised on an Eminence, as is the first Man, our Horizon will be high; if we be only our own Height, as is the second Man, the Horizon will be our own Pitch; and if we be seated or laid along, as is the third, the Horizon will be low: So that 'tis the Horizon shews how high the Eye is above the Ground.

This, in Effect, is the principal Article in a Picture, and that which directs and gives Law to all the rest; both as to the Slope and Inclination of Buildings, and to the Measures and Heights of the Figures. This has occasioned a little Dispute among our best Painters; some of them holding that all Paintings should have their Horizon in the Work itself, and that Perspective allows, where the Painting is raised very high above the Eye, that it have its particular Horizon: The rest do not allow of such a second Horizon, but always use the natural one, where-ever the Painting be placed; as imagining that the whole Height and Breadth before them is, as it were, one large Painting, from which that which is raised above ought to take its Measures. The Respect we bear to the Patrons of each Opinion will not allow us to determine between them; especially, as several good Authors have tolerated both. But, if my own Sentiments were asked, I should make no Scruple to profess myself of the Opinion of these latter; by Reason every Thing in the Painting will thereby appear the more natural.

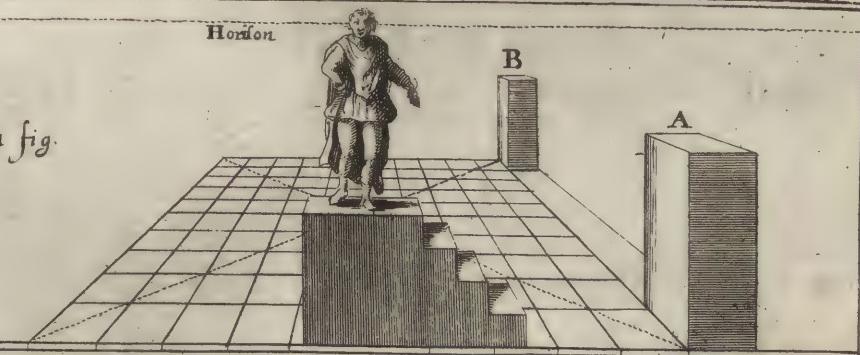
In this Line are always found the Points of Sight and Distance, and sometimes the contingent or accidental Point. 'Tis this Line, in fine, that separates Heaven from Earth, and that terminates the View; and it is always parallel to the Bottom of the Piece, or the Plan the Object is placed upon: Whence it appears that nothing ought to be placed above the Horizon, but what surpasses the Height of the Eye; and if an Object be so high as that it surpasses this Horizon, the Plan of the same Object must be placed below it: Thus, a Tree or Mountain may have its Top above the Horizon, but its Bottom must be a good deal below it.

Whatever is below the Horizon shews its Top; but in Objects ever so little above it, the Top is invisible: Thus, the two Blocks A B, placed on the Ground of the first Figure, shew their Tops, by Reason the Horizon is over them; but in those of the second Figure C D, the Top does not appear; and much less in those of the third Figure: Yet, in Reality, they are all of the same Height, so that 'tis the Horizon makes all the Difference.

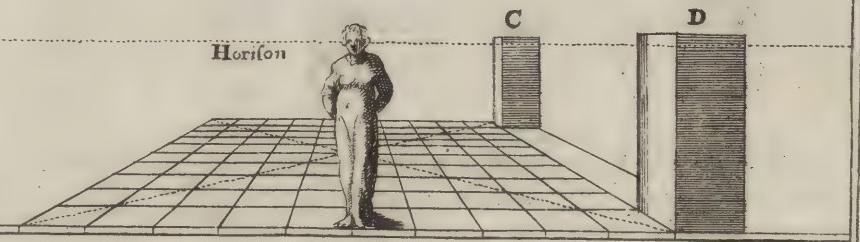
PRACTICAL.

II

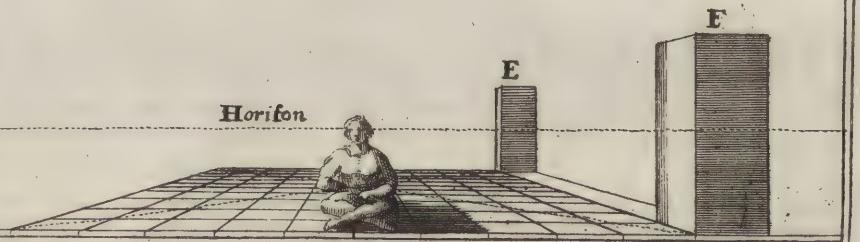
1 fig.



2 fig.



3 fig.



PERSPECTIVE

Of the Terrestrial Line.

THE TERRESTRIAL LINE, BASE LINE, or LINE of the PLAN, is the Line an Object is placed or stands upon, whereof each Object has its particular one, and the whole Draught a general one. This is always parallel to the Horizon, as is seen in A B of the first Figure, F G of the second, and N O of the third ; and sometimes serves to determine the Lengths and Breadths, particularly that at the Bottom of the Piece, whereto all the Measures are to be accommodated, as will be shewn hereafter.

Of the Point of Sight, Point of the Eye, principal Point, or Point of Perspective.

THE POINT of SIGHT, of the EYE, PERSPECTIVE, or PRINCIPAL POINT, is a Point in the Axis of the Eye, or in the central Ray, where the same is intersected by the Horizon. Thus the Point E in the first Figure is the Point of Sight in the Horizon C D, wherein all the visual Rays meet. It is called the *Point of the Eye*, or *ocular Point*, because directly opposed to the Eye of the Person who is to view the Piece.

Of the Points of Distance.

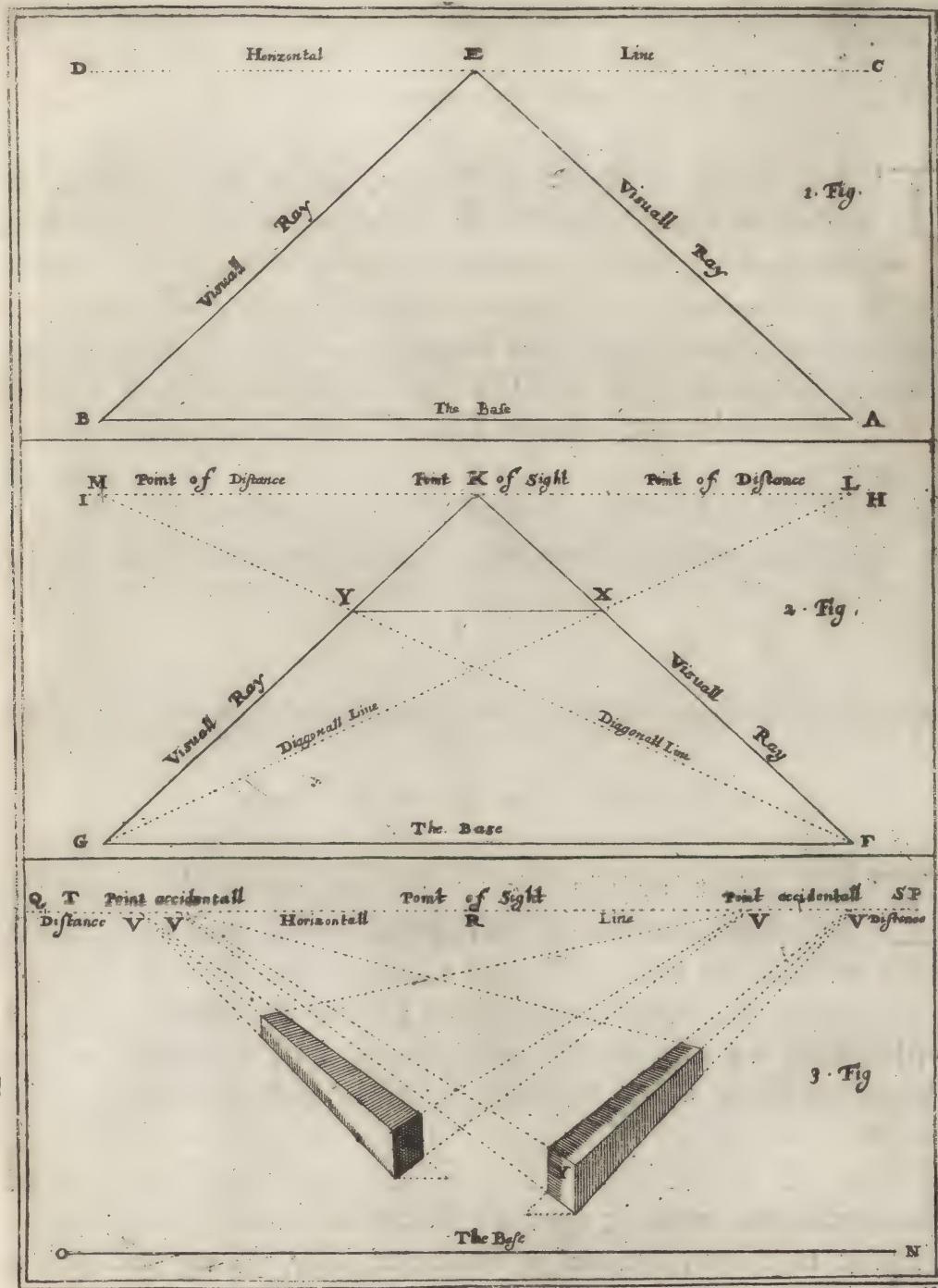
POINT of DISTANCE, or POINTS of DISTANCE, is a Point, or Points (for there are sometimes two of them) placed at equal Distance from the Point of Sight. They are thus denominated, by reason the Spectator ought to be so far remov'd from the Figure, or Painting, and the terrestrial Line, as these Points are from the Point of the Eye, and are always to be in the horizontal Line. Thus H I being the Horizon, and K the Point of Sight, L and M are Points of Distance, serving to give all the Shortnings. Thus, *ex. gr.* if from the Extremes of the Line F G you draw two Lines to the Point K, and from the same Points draw two Lines to the Points of Distance M and L, where these two Lines G L and F M cut the Lines F K and G K, in the Points X and Y, will be the Line of Depth, and the Shortning of the Square, whereof F G is the Side and Base. The Lines drawn to the Point of Sight are all visual Rays, and those drawn to the Points of Distance, all Diagonals.

Of the Accidental Points.

CONTINGENT, or ACCIDENTAL POINTS, are certain Points wherein such Objects as may be thrown negligently, and without Order, under the Plan, do tend to terminate. For this Reason they are not drawn to the Point of Sight, nor the Points of Distance, but meet accidentally, and at random, in the Horizon. Thus, for Instance, the two Pieces of Wood X and Y terminate in the Points V V V V in the Horizon P Q, not in the Point of View, which is R, nor in the Points of Distance S and T. Indeed sometimes the Objects are so ill disposed, that these Points must be made out of the Horizon, as we shall have Occasion to shew hereafter. They serve particularly in the Apertures of Doors, Windows, Stair-cases, and the like.

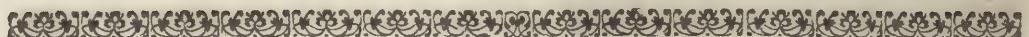
PRACTICAL

12



D

12



Of the Point of the FRONT.

THE Point of DIRECT VIEW, or of the FRONT, is when we have the Object directly before us, and not more on one Side than the other; in which Case it only shews the Fore-side, and, if it be below the Horizon, a little of the Top too, but nothing of the Sides, unless the Object be polygonous. Thus the Plan A B C D is all in Front, and, if it were rais'd, we should not see any Thing of the Sides A B, or C D, but only the Front A D: The reason is, that the Point of View E, being directly opposite thereto, causes a Diminution on each Side; which, however, is only to be understood where an Elevation is the Object; for, if it be a Plan, it shews the whole, as A B C D.



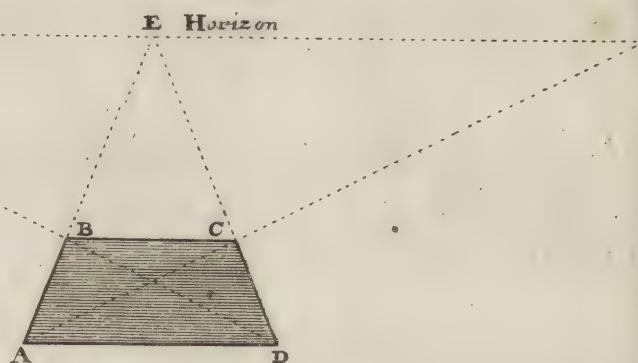
Of the SIDE POINT.

THE Point of OBLIQUE VIEW, or of the SIDE, is when we see the Object aside of us, and only, as it were a-slant, or with a Corner of the Eye; the Eye, however, being all the while opposite to the Point of Sight: In which Case we view the Object laterally, and it presents us two Faces, or Sides. For Instance, if the Point of Sight be in F, the Object G H I K will appear a-thwart, and shew two Faces, G K and G H; in which Case it will be a Side Point. The Practice is the same in the Side Points as in the Front Points; a Point of Sight, Points of Distance, &c. being laid down in the one as well as the other.

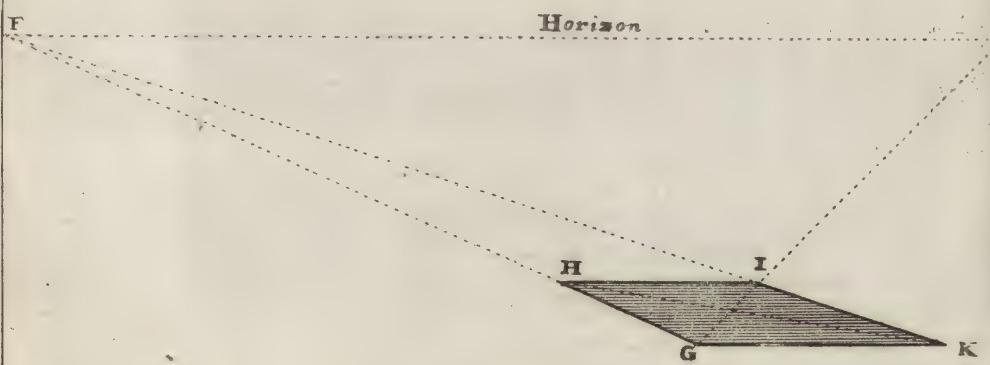
PRACTICAL.

13

1. Fig.



2. Fig.



D 2

PERSPECTIVE

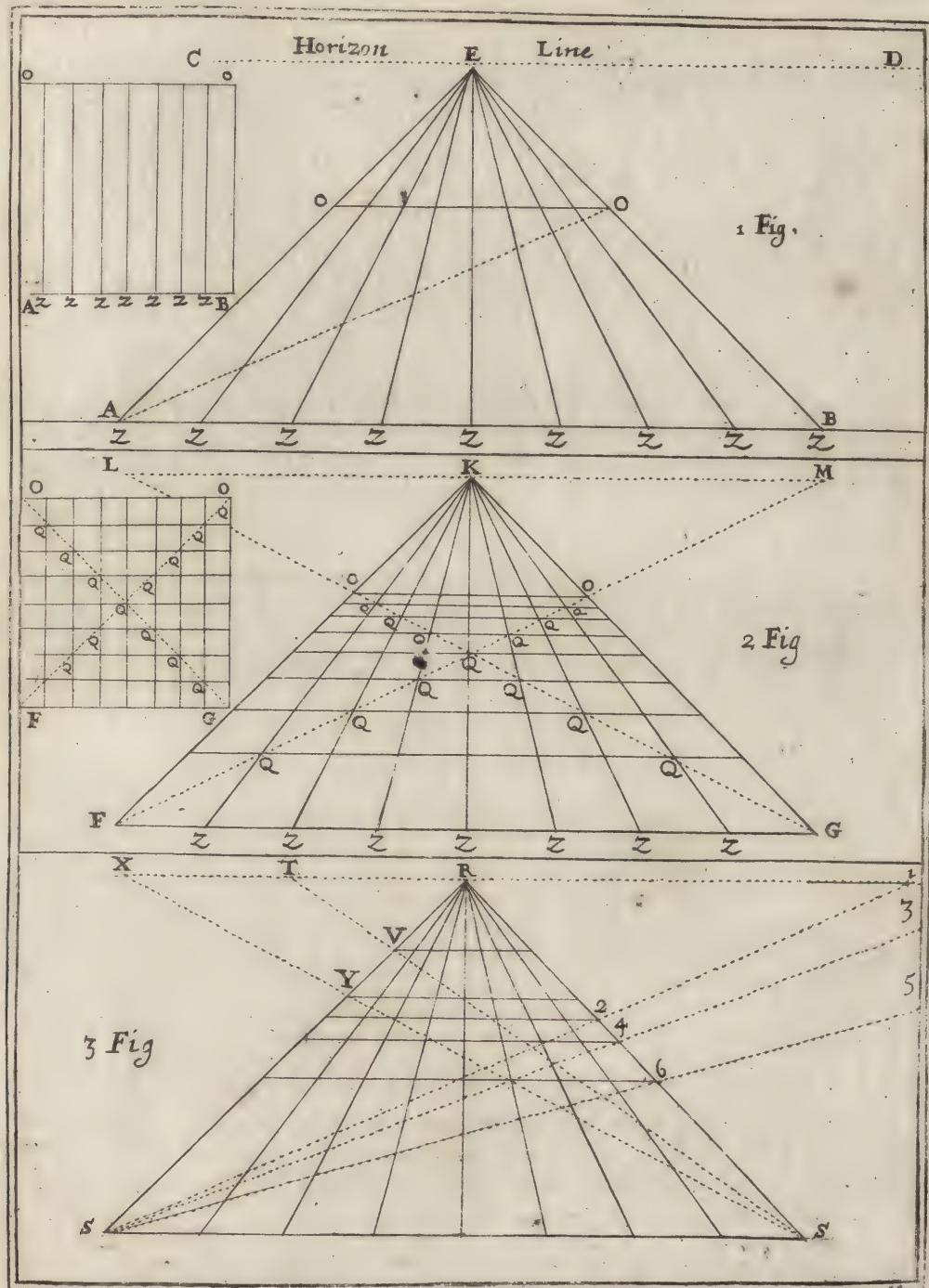
Of the VISUAL RAYS.

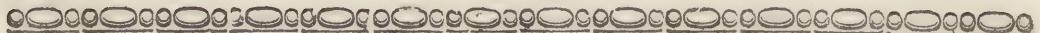
THIS is an universal Rule, That all the Lines which, in a geometrical Plan, are perpendicular to the terrestrial Line, be always drawn to the Point of Sight, when the said Plan is to be put in Perspective: Thus, in the little Plan A O, O B, Fig. 1. A B is the terrestrial Line, to which all the Lines Z, Z, &c. are perpendicular. But if the Plan be to be thrown into Perspective, and either a greater or a less Line than that of the Plan be pitched on, ex. gr. the Line A B, which has the same Number of Divisions as the small one, from the several Divisions Z, the Lines are to be drawn directly to the Point of Sight E. Such Lines are properly denominated Radials and visual Rays; and the last of them, the Extremes, as being drawn from the Extremities of the terrestrial Line A B.

Of the DIAGONALS, or DIAMETRALS of their Sections.

THIS likewise a Rule, That all the Diagonals of Squares in the Plan be drawn, in Perspective, to the Point of Distance: Thus, in the little Plan of Fig. 2. the Diagonals G O and F O are drawn to the Points of Distance; when the same Plan comes to be put in Perspective, and by such Means the Shortnings or Diminutions of the Objects are got: So, if from the Extremes of the Base Line F G, Lines be drawn to the Points of Distance L M, they will be Diagonals; and where those Lines cut the extreme Rays F K and G K in the Points O, will be marked out the Diminution of the Square, whereof F G is the Side; and where the same Lines cut the Lines Z, Z, &c. in the Points Q, Q, &c. Parallels to the Base Line are to be drawn, which will give the Diminution of all the Squares, and the same Number of Sides as in the little Plan. And still, the more remote the Points of Distance are from the Points of Sight, the more the Objects are diminished. Hence all the Beauty of a Perspective depends on the nice Adjustment of the Interval between the Points of Distance and that of Sight: On which Account we have added a third Figure, with a Diversity of Intervals, to evince the Truth of what is just now observed. Suppose then R to be the Point of Sight, and S S the Extreme Rays; if the Point of Distance be at T, it will cut the Ray S R in the Point V, which will give the Diminution of the Square, whereof S S is a Side: But it would be ridiculous to see a Square so extravagantly deep from the Point of Distance T, being so much too near the Point of Sight R. In Effect, the least, that is any-wise allowable, is for the Point of Distance to be removed from that of Sight, half the Breadth of the whole Draught or Perspective; (such as is the Distance of X from R;) by reason such Removals always give a Right Angle at the Spectator's Eye. It would, however, be still more agreeable at 1, the Line in that Case cutting the Square at 2; and it would be better yet at 3, cutting at 4; and best of all at 5; being then remote enough, and making the Square shorter at 6: The Reason whereof will be assign'd under the following Figure.

It may be demanded, Why, throughout the Course of this Work, I have put the Points of Distance so near, when they have so much better Effect at a greater Distance? The Answer is, That the Book not being intended to be view'd merely out of Curiosity, but to instruct, it was necessary every Circumstance should be seen, that the Methods might be the better conciv'd: For this Reason we have included as much of the severall Operations as possibly we might.

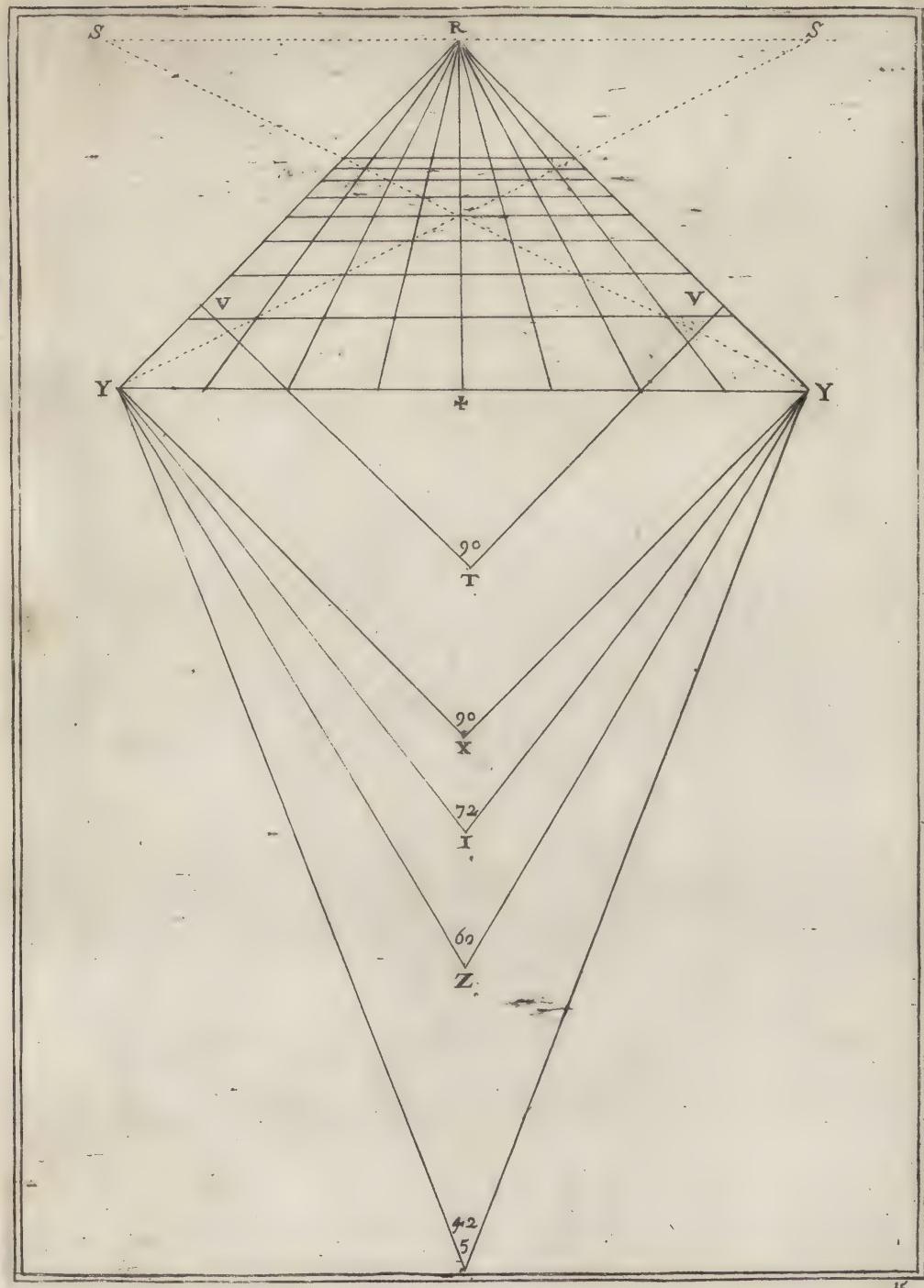


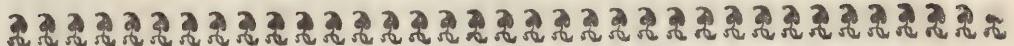


Of the DISTANCE, or REMOVAL.

WE have already said, in speaking of the visual Rays, that the Eye cannot commodiously take in more than is included in a right Angle; that is, that the Sight does not receive Objects fully and distinctly, when the visual Rays exceed a right Angle. The Reason is, that the Pupil being nearly in the Center of the Eye, does not well admit above a Quadrant of a Circle; so that all the Rays exceeding that, have only a dim confused Effect. On this Account it is better to have the Angle less than greater; for Instance, two thirds of a right Angle, or sixty Degrees, but not less, by Reason the Rays, in such Case, being so straitened, do not satisfy the Eye, the Angle being little more than a Point in the Pupil. To shew this Difference in Figures: Suppose the Plans and Squares the same as in the last Figure, the Distance of the Point T from R will give the Distance of T from the terrestrial Line; where it would be necessary the Angle should open much farther, to see the Extremes Y Y. If it only opened to a right Angle, the Eye could not see all; as T, for Instance, could not see beyond the Points V V: Whence would arise a very faulty Perspective, inasmuch as what should exhibit a Square, will now only form a Parallelogram. The nearest one can put it is in the Point X, which, as we have already observed, is the just Measure of a right Angle, comprehending the whole Piece Y Y. If it be carried still farther back from the Point of Sight, it will be still the more agreeable, as in I, where the Angle will only be 72 Degrees: If it be brought back as far as Z, it will be in Perfection, inasmuch as the Rays being now the less dilated, have the more Force, and exhibit Objects with the greater Vivacity. But I would never choose to go beyond five, for the Reason already insinuated, that the Angle then dwindles to a mere Point. Too much Care, then, cannot be taken in the Disposal of Points of so much Importance; with Regard to which it must be esteemed a certain Rule, that the Distance be equal to the Space between the direct Ray and the Corner of the Perspective. + R, for Instance, is the direct Ray and X + the least Distance, which is equal to + Y. This Measure being taken, must be set off each Way from the Point of Sight, as here from R to S S; or only one Way, as in the following Page.

Thus much we learn from Reasons that regard the Eye: But Experience furnishes another noble Rule, which may be general too, provided it be used with Discretion, *viz.* That having chose the Place where the Perspective is to be made, you are to determine from what Quarter it is to be seen to the best Advantage; then taking the Distance from this Place to the first, set off this Interval, by a little Scale, from the Point of Sight to the Point of Distance, provided it be not too remote: Which is a Circumstance that will require some Discretion, to avoid the Inconveniences either of placing it too near, or too far off.





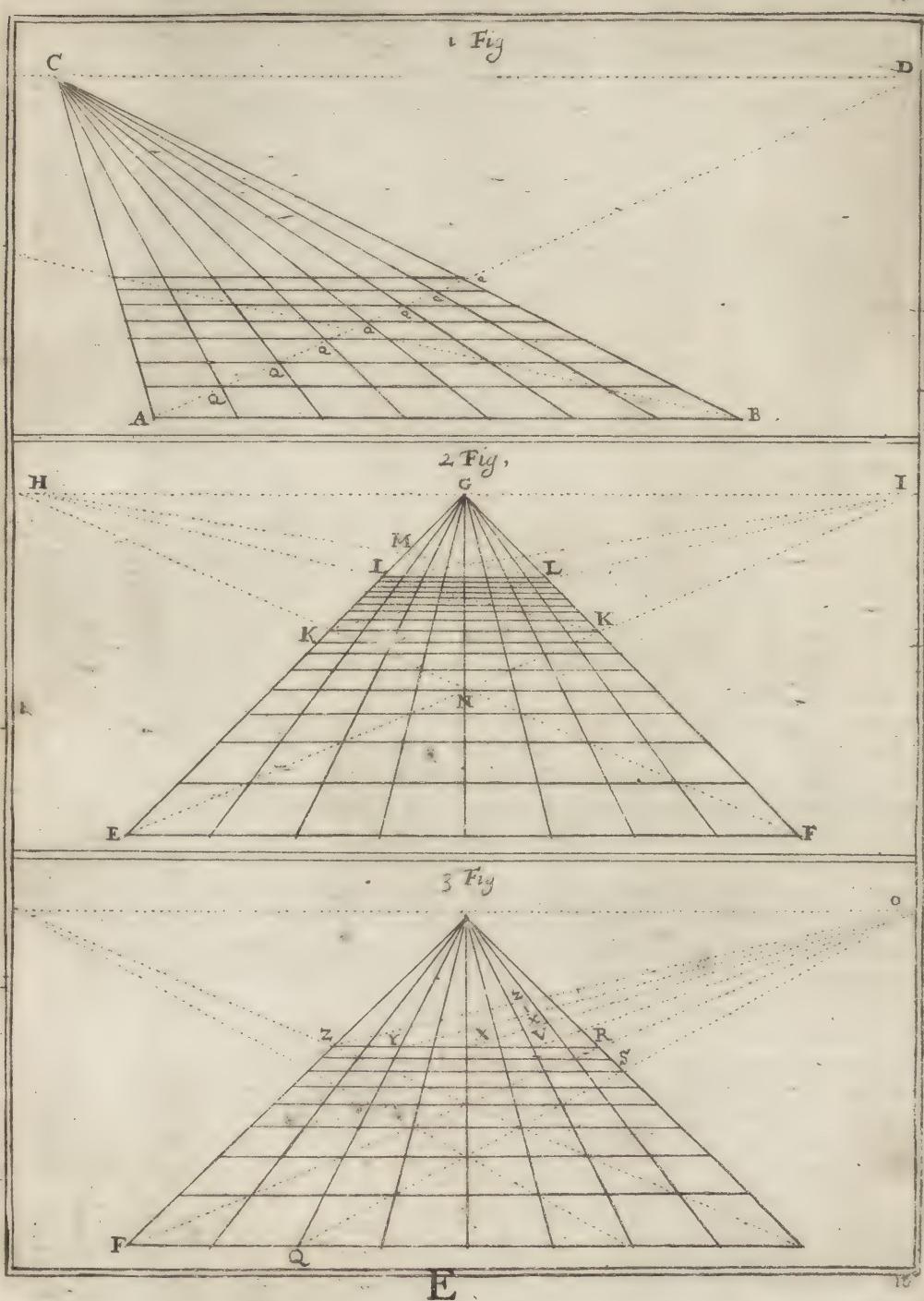
A D V E R T. I. *Relating to the Side-Point.*

TH E Rules for the Front Points, are never chang'd for the Points of the Sides, as being both founded on the same Cause, which always produces the like Effects: We shall spare therefore to speak particularly thereof, the Practice for Side Points being the same as for those of the Front; as is shewn in Fig. 1. where the terrestrial Line A B has the very same Divisions as the preceding ones: And if the Point of Sight be supposed in C, and the Point of Distance in D, drawing the Line A D, you will have the Intersections Q, Q, &c. which give the Diminutions of the Squares in the same Number as the former. The rest will be learnt from the succeeding Rules.

A D V E R T. II. *Of the Depths or Hollowings.*

A PERSPECTIVE may be sunk as deep as one pleases, by means of the terrestrial Line, drawing Lines from that Line, as E F, to the Points of Distance H I: for where they intersect the visual Rays E G and F G, in the Points K, K, we have already observ'd, the Diminutions of the first Square will be. Now, if we take this Line K L for the terrestrial Line, and from its Extremes K K draw Lines to the Points of Distance; where these cut the same Lines E G and F G, viz. in the Points L L, will be the Diminution of the second Square, which will have as many Divisions and Squares as the first. Again, if we take this Line L L, and repeat the same Operation, we shall have the Diminution of the third Square in the Point M: And if we begin again with this, we shall have a fourth; and so on, till we arrive at a Point, which will be a Length that will appear infinite. By such Means, then, it is easy sinking and shortning Perspectives: Thus, if you would have it twice its Width, proceed as already directed; and if you would only have it half thereof, draw a Line where those from the Points of Distance intersect each other, and you will have your Request.

Since this is infallible, that as many visual Rays as cut the Diagonal Line, drawn from the Points of Distance to the terrestrial Line, so many Squares of Depths you have; it follows, as has been already hinted, that you may give the Perspective what Depth you please. For if, instead of drawing the Diagonal from the Ray F to the Point of Distance O, you draw it from Q, you will want two Squares of the other diminish'd Square R; and if you would have two Squares more than the Square R, draw a Line from the same Point O, cutting two Rays, to V: If you desire four, take X; if six, Y; and if the entire Square, Z: Which is a wondrous Easiness, when well understood.



A D V E R T . III. *Of the Measures upon the Base.*

B Y the Base Line alone one may give any Depth, and in any Place, at Pleasure, without the use of Squares; which is a very expeditious Way, tho' somewhat difficult to learn. We shall, however, endeavour to make it understood, by Reason we shall make frequent use thereof. For an Example; Suppose the Base Line, BS; the Point of View A; and the Points of Distance D E; if now you would make a Plan of a Cube BC, draw two occult, or dotted Lines, from the Extremes BC, to the Points of Sight: Then, to give the Breadth, take the same Measure BC, and set it off on the terrestrial Line CF; and from F draw a Line to the Point of Distance D; and where this Line intersects the first Ray C, in the Point G, will be the Diminution of the Plan of the Cube BHGC.

If you would have an Object farther towards the Middle, take the Breadth and the Distance of the Base Line, as IK; and to have the Depth, set it as you would have it on the same Base, as LM, and its Width both on LM; then from L and M draw occult Lines to the Point of Distance D, and from the Points NO, where those Lines intersect the Ray K, draw Parallels to the terrestrial Line, and you will have the Square Q P O N.

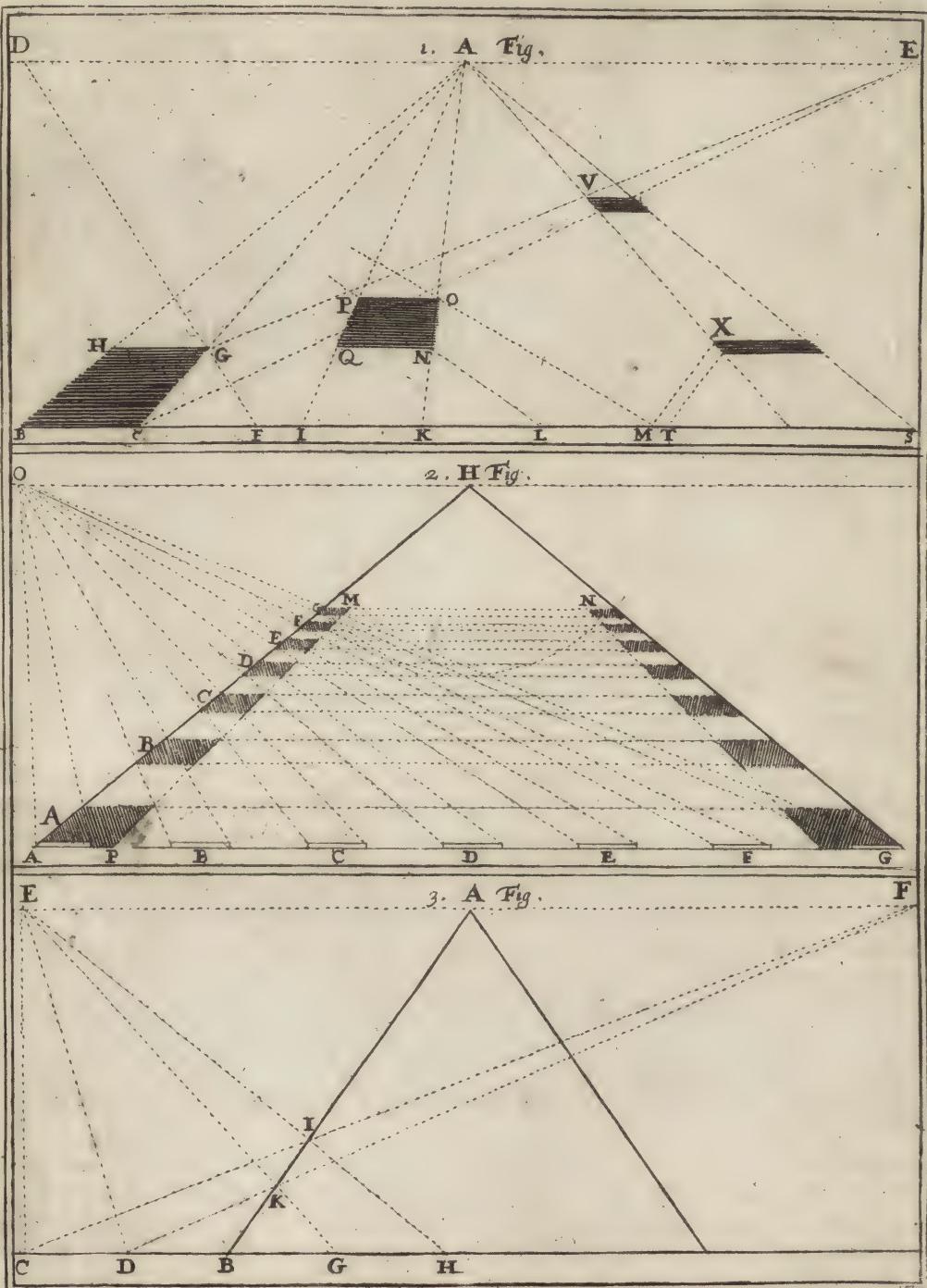
After the same Manner may you set off the other Side of the Square, which should be on the Base; as BHGC is here transferred to V. The Points M and T, which are only two Feet from the Point S, afford a very narrow Figure in X, as being very near.

A D V E R T . IV. *Of the Base Line, and a single Point of Distance.*

SINCE the Depths and Widths may be had by Means of this Base Line, we need not give ourselves any further Trouble in the making of Squares; as shall be shewn in this Example. Suppose a Row of Trees, or Columns, is to be made on each Side; on the Base Line lay down the Place, and the Distance between them, with their Breadth or Diameters, as ABCDEFG, then laying a Ruler from the Point of Distance O, to each of the Points ABCDEFG, the Intersections it makes on the visual Ray AH, will be the Bounds of the Objects desired. To set them off on the other Side, upon the Ray GH; set one Foot of your Compasses on the Point of the Eye H, and with the other strike an Arch: The Point wherein this cuts the Ray GH, will be the corresponding Bound. Thus M will be the same with N, and so of the rest; thro' which drawing Parallels, you will have the Breadths. And as for the Length, make it at Pleasure; setting it off from A, for Instance, to P, and then from P drawing a Line to H; and where this cuts the other Parallels, will be formed the Plan required: Which you may make either round or square.

A D V E R T . V. *Not to deceive one's self in the Measures.*

NEVER put any Objects that are intended to be within the Plan, on the Side of the Point of Distance, where you are to draw Lines for managing the Depth. Thus, suppose AB the visual Ray whereon the Measures are to be marked; if you would produce the Points C and D thro' the same, don't draw the Lines from the Point of Distance E, but from that opposite thereto, F: Or if C and D were on the Inside, as G and H are, you should not draw from the Point F, but from E; by Reason the Line of Intersection is found between the two. Consequently, the two will cut each other in the same Points I, K.





ADVERT. VI. *Of a single Point of Distance.*

A PERSON is sometimes so streightned for want of Room, either on a Wall, a Cloth, Paper, or the like, that it is impossible to make above one Point of Distance: On which Occasion, such as have been always accustomed to two, find themselves at a Loss. This we are now to recover them from, and to give them to understand how a single Point suffices for the Business. Suppose, then, we have a Pavement to make of square Stones, and that we have already drawn all the visual Rays to the Point A; to get the Diminutions of which, we have Lines to draw to the Points of Distance, the Intersections whereof are to give us Points for Parallels to be drawn through: But here being only one, *viz.* B, draw the single diagonal Stroke CB, to cut all the visual Rays. And, to mark the same Intersections on the opposite Rays, for the drawing of Parallels; set, as already directed, one Foot of your Compasses in the Point A, and sweep the other through all the Intersections, as IP. This however is only adviseable for what is to be viewed in Front; another Method is to be given for what is to be seen Side-wise; thus: Set one Foot of your Compasses on the Base Line, and with the other take the Intersection you want to transfer, as D, and set it upon the Perpendicular OE, marking the Extent thereof, as F; then draw a Line from D to F, and you will have the same as if there had been two Points of Distance. And so of all the other Intersections.

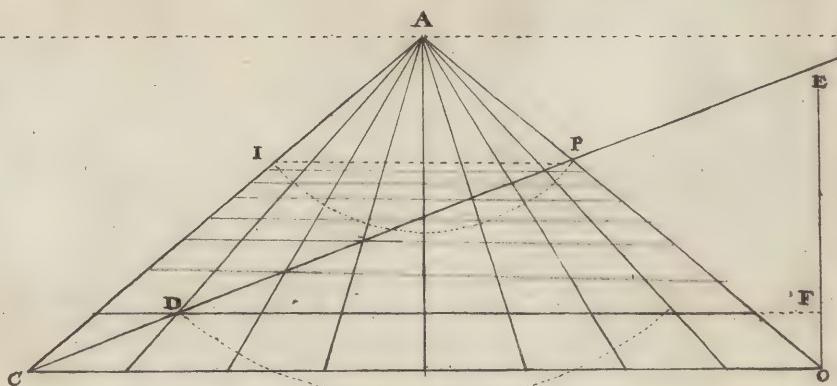
ADVERT. VII. *How to do without making Use of the Diagonal.*

IF one would use the extreme Ray GH for the Line of Intersection, the Objects KLMNO must be set on the Base Line, and from them Lines are to be drawn to the Point of Distance I; which is here to be removed as far as possible, that the Diminution of the Perspective may have the better Effect: (For if that Point were too near the Point of Sight G, the Objects would be too flat; I mean, for Example, that a Square would appear a Parallelogram.) Then from the Point I draw Lines to the several Objects KLMNO, and mark the Intersections thereof on the Ray GH, and through these Intersections draw Parallels to the terrestrial Line, as here PQ, &c. This Method is not much in use, tho' some set a Value on it.

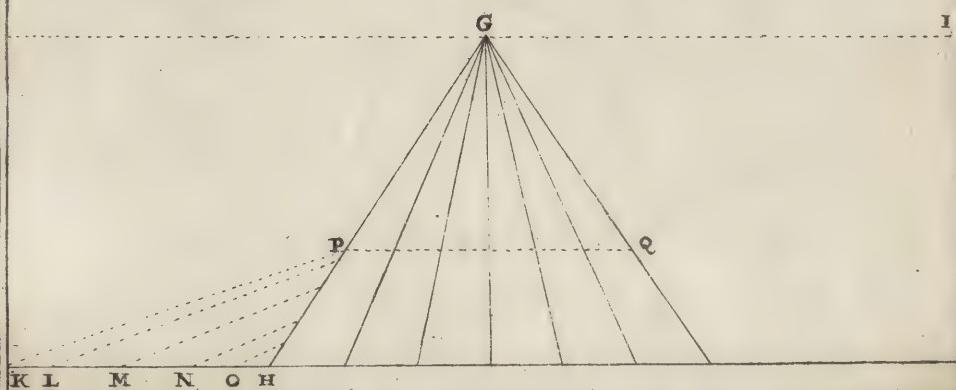
ADVERT. VIII. *Of several Ways of Shortning or Diminishing.*

IF you chance to be streightned, and cannot remove the Point of Distance far enough; from the Foot of the Ray RS erect a Perpendicular TS, which will receive the Intersections, and give a greater Diminution: And if you would have the Diminutions still more, draw a slope Line, as X, which, by Means of its Inclination, will give the Intersections still closer: Then, to draw the Parallels, you have nothing to do but set off the Line X or T on the Foot of the Ray, as in V; and from those Points draw Parallels to the terrestrial Line.

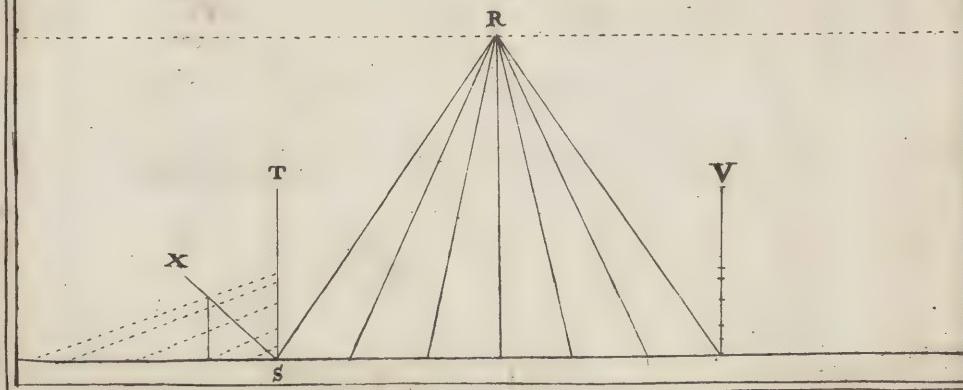
1. Fig.

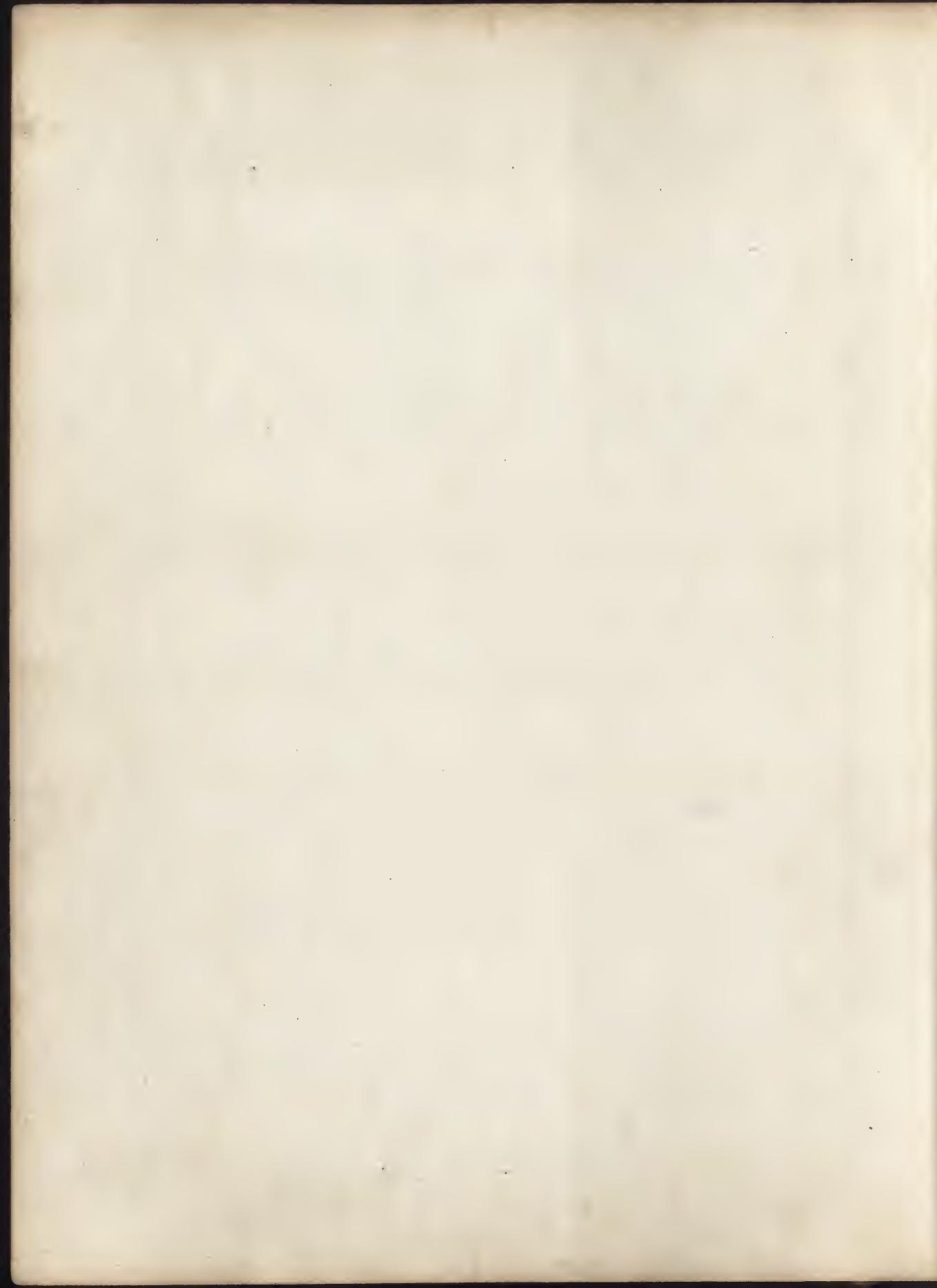


2. Fig.



3. Fig.





M E T H O D S

OF PUTTING

P L A N E S

I N

P E R S P E C T I V E.

PERSPECTIVE

Of Planes view'd directly, or in Front.

FROM *Advert.* III. and IV. as well as from the Elevations that follow; it will appear that our Intention is not to use geometrical Plans, in order to the drawing of Perspectives: That being a double Labour; and there being scarce any Painter would give himself the Trouble, seeing I teach him to do the same Thing, by the use of the terrestrial Line. But, as there is no Rule so general, but has its Exception; so there are certain Figures which cannot be put in Perspective without the use of such Plans: Beside, the Confusion a Man would be under, should a Plane be given him to put in Perspective, if he had not been instructed how to proceed. On such Considerations, I have been induc'd to give the following Rules; which may suffice to shew how any Plane that can be requir'd, or even imagin'd, may be put in Perspective.

1. *To shorten, or diminish a Square;* as A B C D: From A and B, to the Point of Sight E, draw the Lines A E, B E; and from the same Angles A and B, draw two Diagonals F B, A G; and the Points H and I, where they intersect the Rays A E and B E, will give the Square A B C D, diminish'd in A H I B. To do it without the geometrical Plan; draw a Line from B to F, or from A to G; or set off the Line A B on the terrestrial Line; as in B K: and from K draw another Line to F; which will give the same Intersection I, on the Ray B E.

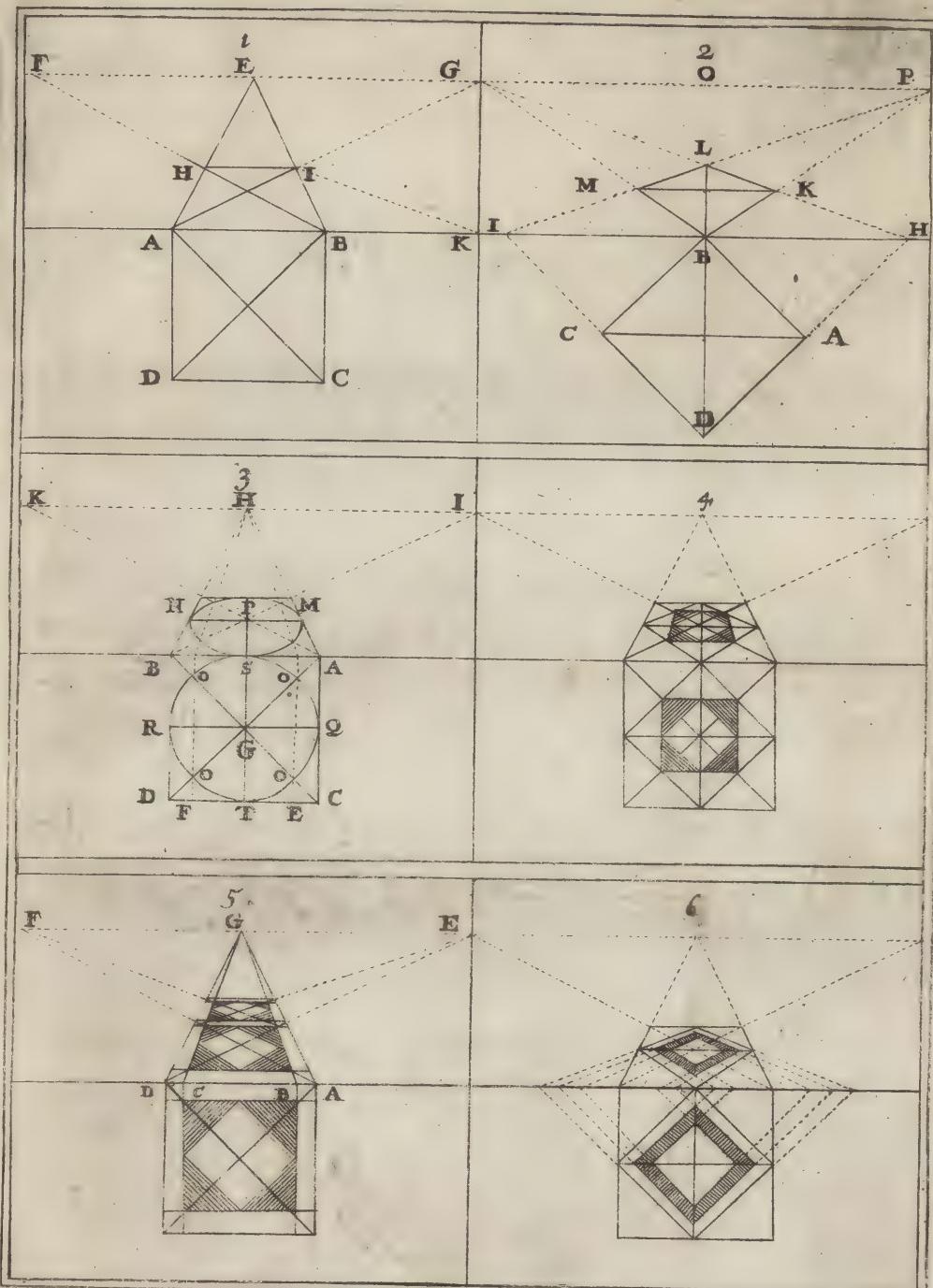
2. *To diminish a Square view'd by the Angle D:* Having describ'd the Plan A B C D, draw a Line to touch or rase the Angle B, and falling perpendicularly on B D. This being continued as a Base-Line, lay your Ruler on the Sides of the Square A D and D C; and where the Ruler cuts the terrestrial Line, make Points, H I. Then from H and B draw Lines to the Points of Distance P; and from I draw a Line to the other Point of Distance G; and in the Intersections of those Lines make Points, which will give you the Square K L M B. To do without the Plan: Set off the Diameter each way from the middle Point B; as, to H and I. But in either Case no Line is to be drawn to the Point of Sight, O.

3. *To diminish a Circle:* Draw a Square A B C D about it; and from the Angles A D and C B draw Diagonals, dividing the Circle into eight Parts; and thro' the Points where they cut it, O O, draw Lines from the Base-Line, perpendicular to D E F. Then draw two Diagonals Q R S P, intersecting each other at right Angles in the Centre G. The Plan thus dispos'd; from all the Perpendiculars draw Lines to the Point of Sight H; and where they are intersected by the Diagonals A K, and B I, make Points; the two last of which, M N, give the Square, which is to be divided into four by Diagonals, intersecting each other in the Point P. Lastly, from the Extremes of this Cross, draw curve Lines thro' the said Points, which will give the Form of the Circle in Perspective. This Method may serve for small Circles; but for large ones we shall give another Method, more exact.

4. This Figure is a Compound of the two first; which is all we need to say about it.

5. This too depends on the two first; only here is a List, or Border, going round, which the others have not. To put the List in Perspective: From the four Rays A B C D draw Lines from the Point of Sight G; and where the inner Rays B C intersect the Diagonals D F and D E, draw Parallels to the Base-Line; and you will have your Desire.

The sixth is the same as the second; except that it is surrounded with two Borders.

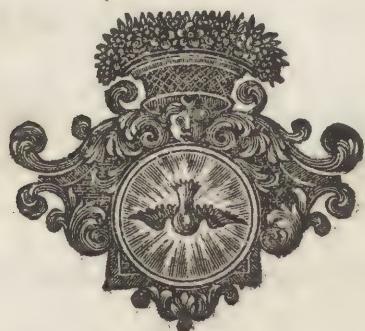


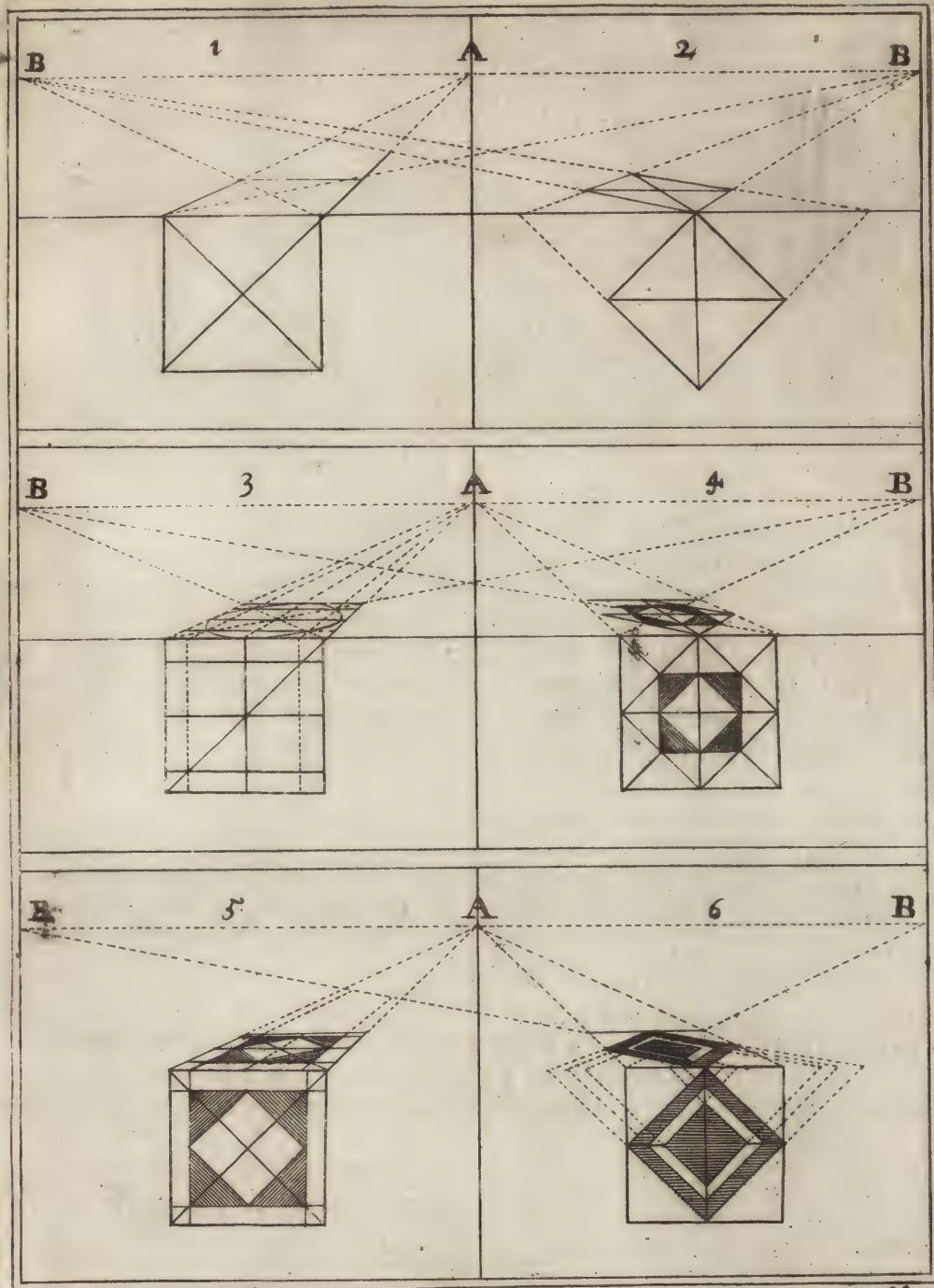


PLANS view'd obliquely, or side-wise.

THESE Plans being much the same with those already dispatch'd, are to be manag'd after the same manner. In Effect, it would be losing Time to repeat how they are to be diminish'd in Perspective; a bare Inspection of the Figure sufficing to shew, that all the Difference between these and the former consists in the Situation of the Objects, which are here shewn laterally, and there in front.

All the A A A's are Points of Sight, and the B B B's Points of Distance.







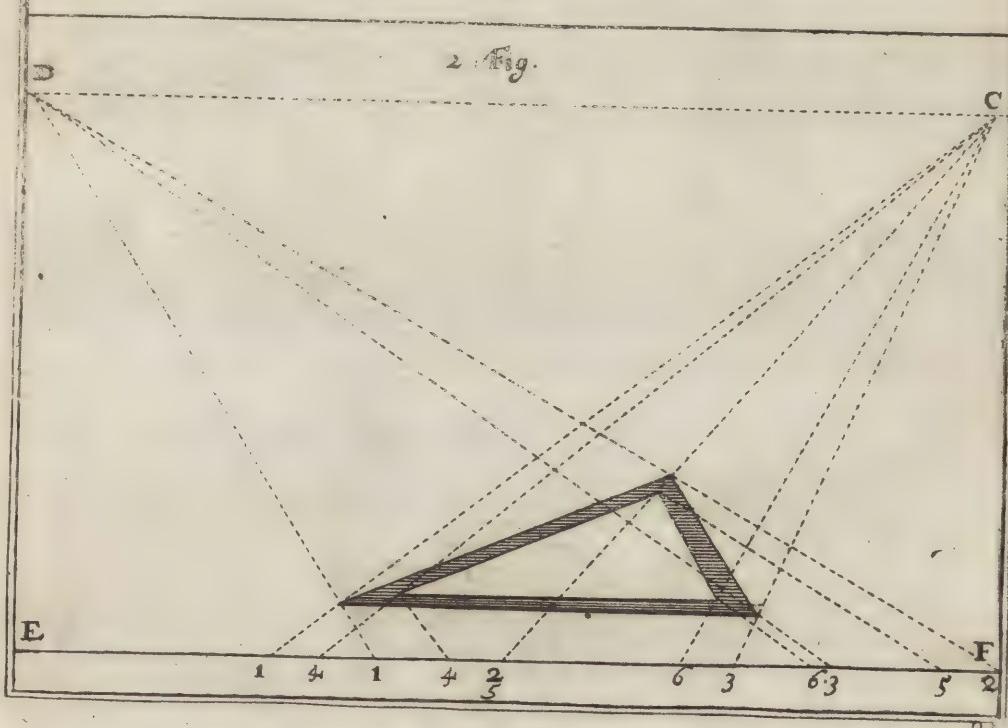
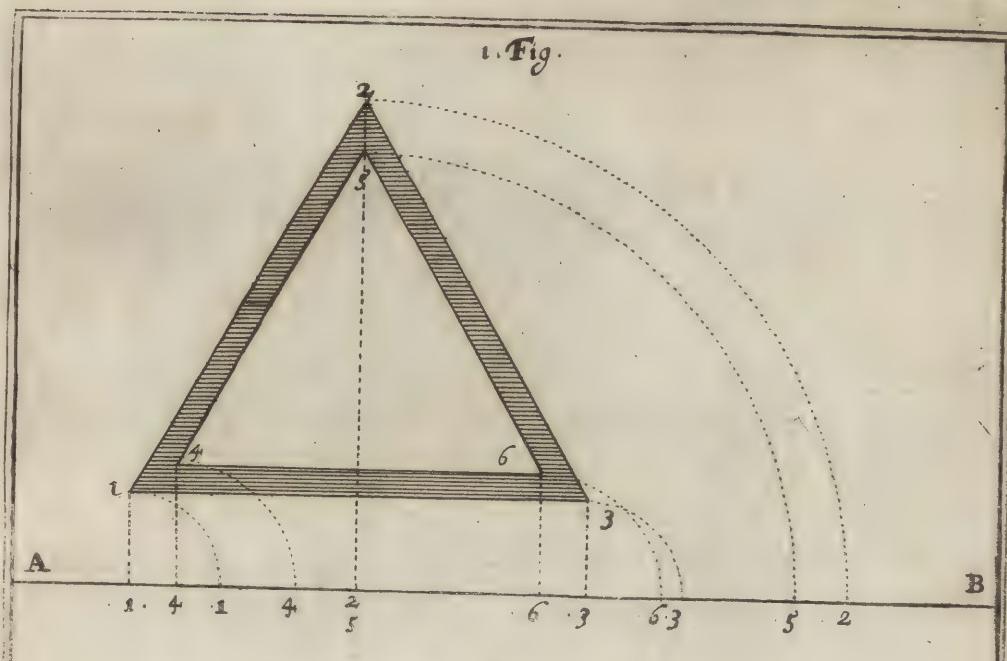
Of a TRIANGLE.

TRIANGLES, according to the Order of Numbers, ought to precede Squares; but, according to Reason, they are to come after them in this Work, as being more difficult to put in Perspective: Not on account of the Plan, which is easy enough, as only consisting of three Lines join'd together, but on account of the Obliquity of its Sides.

We now come to apply some of the Advertisements, relating to the Measures on the Base-Line AB: For, to put this Triangle in Perspective, from all the Angles thereof, 1, 2 and 3. Perpendiculars are to be drawn to AB. Then setting one Foot of your Compasses in the Intersections, with the other set off the Distances of the Parts of the Object from the terrestrial Line, along the same Line, by striking Arches, as from 2 to 2, from 3 to 3, &c. This done, having drawn another Base-Line in another Place, as hereunder E F, transfer the Measures from AB to EF, and to the Point of Sight C draw Lines from the Points 1, 2, 3, &c. Lastly, having pitch'd one Point of Distance D, draw Lines thereto from the other Points of Depth, 1, 2, 3, &c. And between the Intersections made by these with the visual Rays, Lines being drawn, will give the Triangle requir'd.

If you would give it the List or Breadth, repeat the same over again for the several Points thereof; only using other Figures to prevent Confusion; as, next to 1, 4; next 2, 5; 3, 6, &c. Then drawing Perpendiculars to the Point C, and between the Points, where they intersect the others, draw Lines as you see in the Scheme.

The Equilateral Triangle, such as that here described, is inscribed in a Circle, i.e. a Circle may be drawn upon it, every Side subtending 120 Degrees.

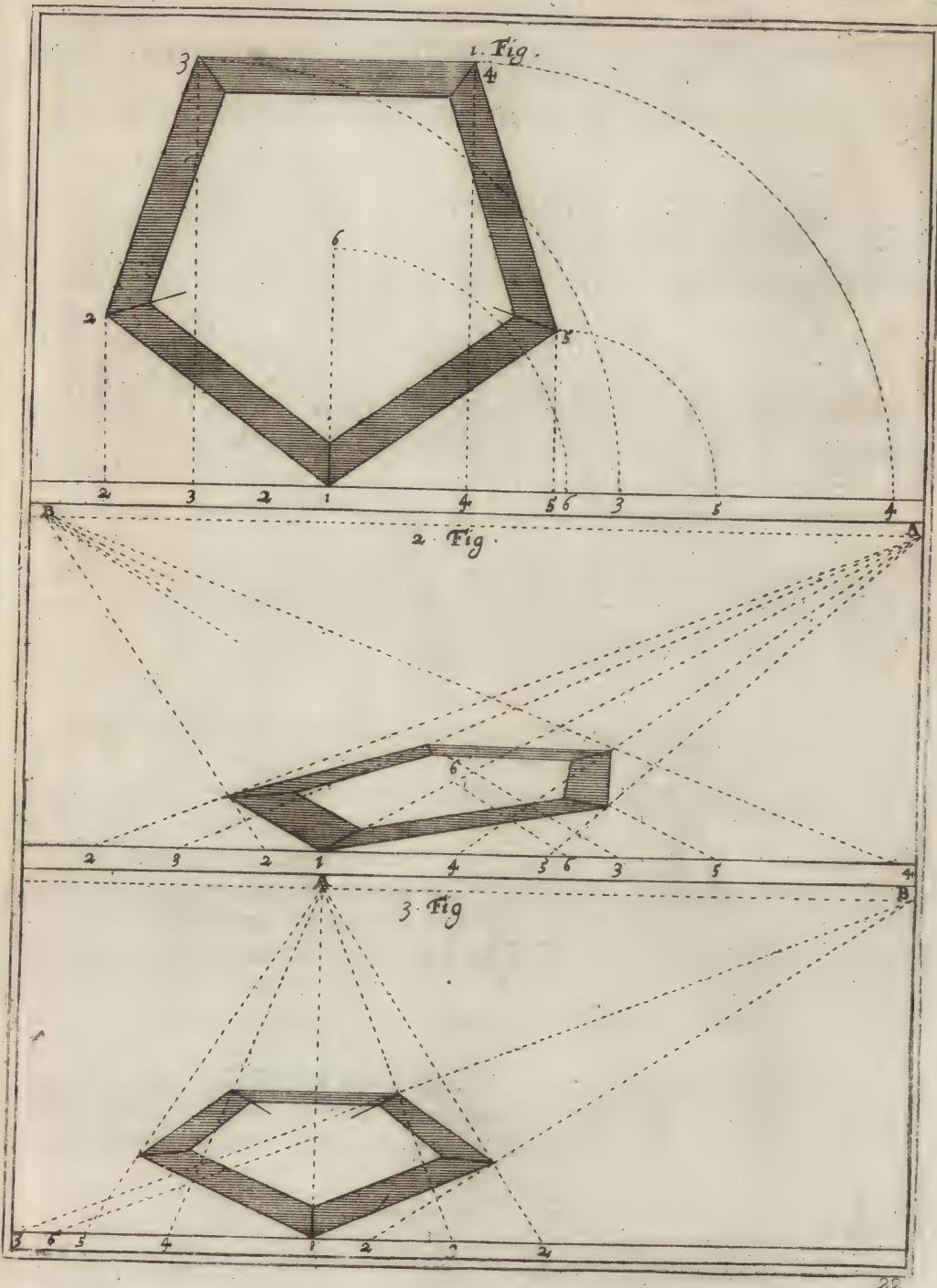




Of the PENTAGON, or Five-Angle.

THE way to construct a Pentagon is to describe a Circle, and divide it into five equal Parts, of seventy-two Degrees each; then, for putting it in Perspective, the Method is the same as for the Triangle, as appears from the Figure: Where, however, it is observable, that there is a List or Breadth, whereas it is only laid down, on the Base Line, single; the Reader being suppos'd sufficiently instructed in what relates to the List, from the Triangle. The Point of Sight, both of the Front and the Side, is A; the Point of Distance B; the visual Rays, which are the Perpendiculars drawn from the Angles of the Plan to the Base Line, are drawn to the Point of Sight A; and the other Rays that give the Diminution, and the Place of the Angles, to the Point of Distance B. As 2 cuts the Ray mark'd 2, which gives the Angle 2, 4 gives the Angle 4; and so of the rest. All the rest is clear enough; regard, however, is to be had to one Thing, that all the Angles tend towards the Center 6: For this Reason the Centre is to be mark'd in the Plans in Perspective, as well as in the geometrical Plans.







Of the HEXAGON, or Six-Angle.

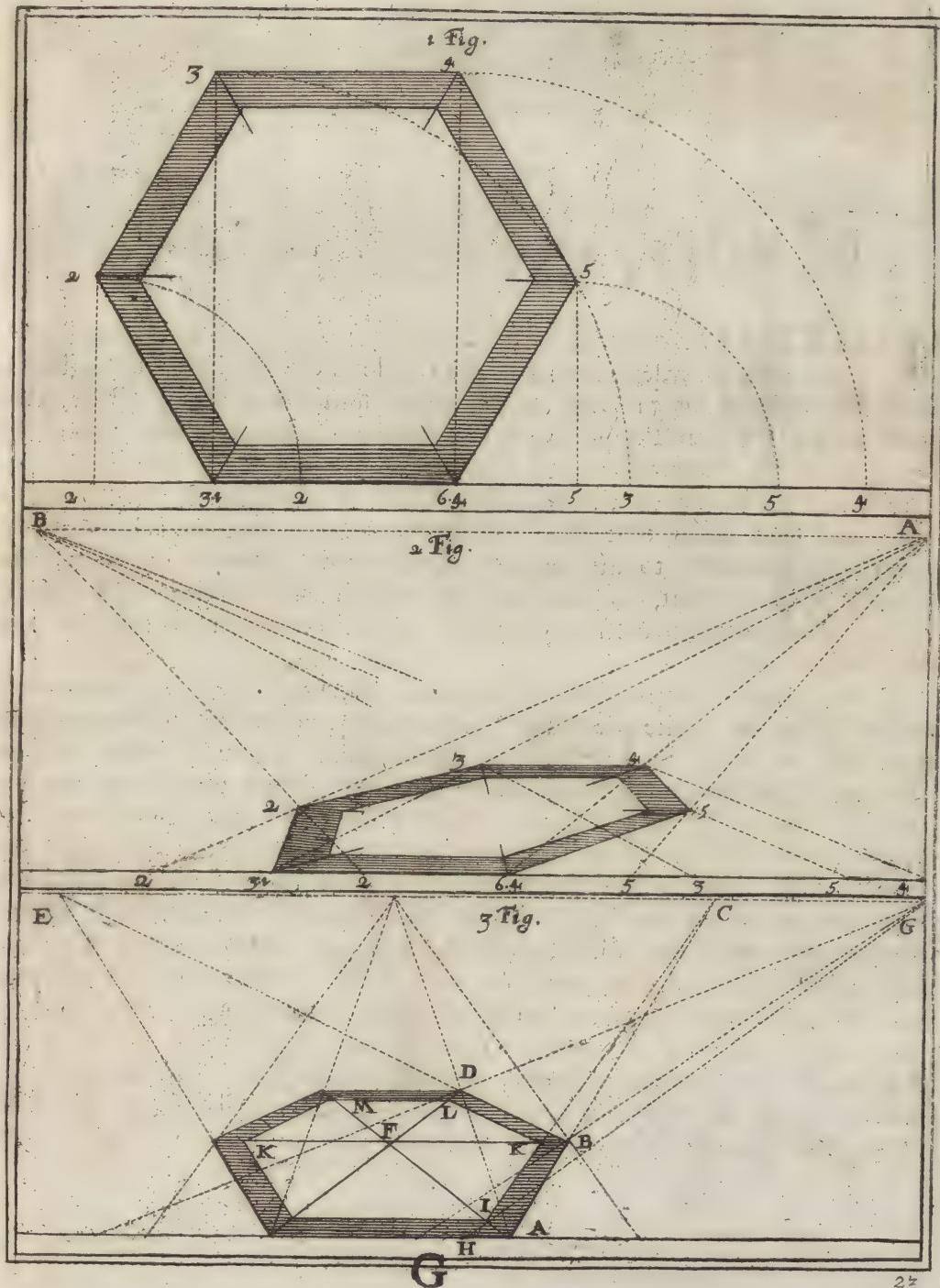
THE HEXAGON is a Plane with six Angles, and as many Sides; 'tis the easiest to describe of all the Polygons, by reason the same Aperture of the Compasses, that is, the Radius wherewith its Circle is described, gives its Sides of 60 Degrees apiece. As to the putting it in Perspective, the Method does not at all differ from that of the Triangle, or Pentagon; either when single, or with the List or Thickness, A is the Point of Sight, and B that of Distance.

Since we have a good deal of room in this Page, we think it not amiss to give a little Method of putting the Lists or Thicknesses of all Polygons, regular or irregular, in Perspective: And the present Hexagon shall serve for an Example of our Proposition. Suppose the Front Plan of Fig. 3. to be only a single Stroke, and it were requir'd to give it a List or Thickness all around: To do this in Perspective, lay your Ruler along the single Sides, and make Points in the Horizon where it cuts the same; thus laying it along the Side A B, it will cut the Horizon in C; then laying it along B D, it will give the Point E; and the like of the other Sides. Before you proceed any farther, draw occult Lines from the several Angles through the Center F, which Lines are to receive the Intersections that give the Diminutions. Such Dispositions made, set the Breadth of the Band or List on the Base-Line, as A H, and draw the first Breadth to the Point of Distance G, and where the Line G H cuts I, will be the Bound of the Thickness of the first Side, which is to determine for all the rest: For from this Point a Line is to be drawn to the Point corresponding to this Side C, and the Intersection of this Line with K will give the Diminution; from the Point whereof drawing a Line to the Point E, corresponding to the Line B D, you will have the Diminution for the Point L, which serves for the last Side L M: Then transferring all the same Measures to the other Side, you will have the Figure complete.

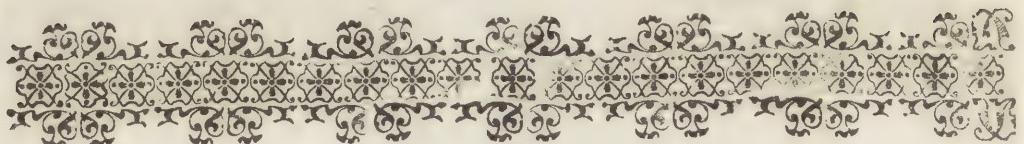
Hereafter we shall have occasion to give another Method.

PRACTICAL.

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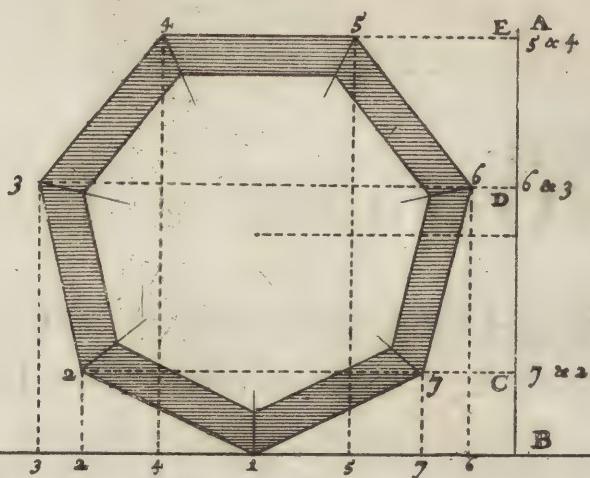


Of the H E P T A G O N, or Sept-Angle.

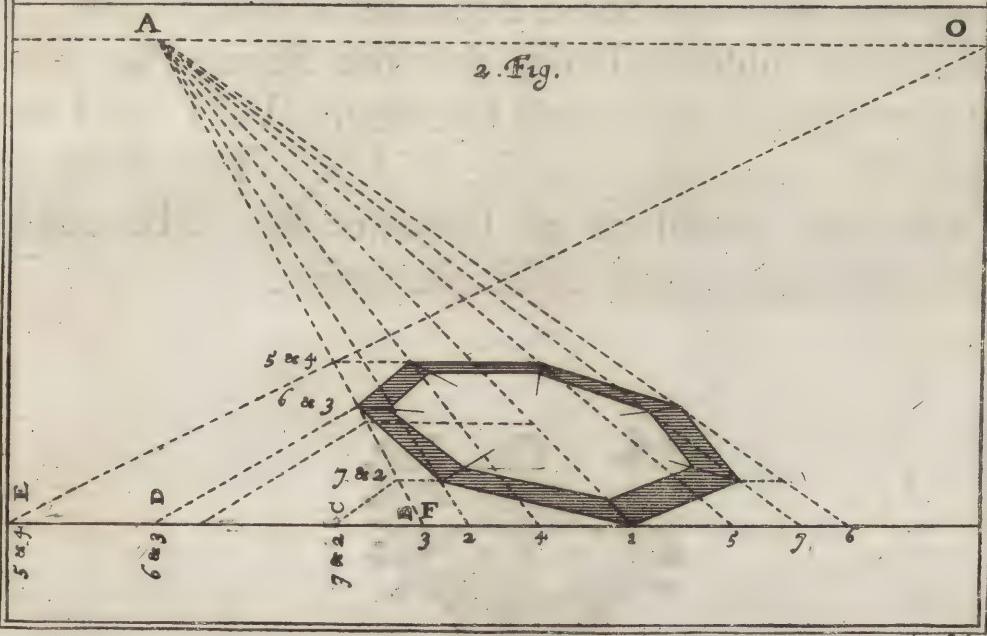
TH E H E P T A G O N is formed within a Circle, as the other Polygons are ; in order to which the Circle is divided into seven Parts, each Side subtending 51 Deg. 25 Min and sometimes more. The Method of putting it in Perspective is the same with that of the preceding ones, as to the Perpendiculars falling from the Angles to the Base-Line, which are all drawn to the Point of View A ; but as to the Diminution, and the Lines that give the Points of the Angles, it is different, and rather according to the seventh *Advertisement*; though we do not absolutely approve that, as thinking the eighth *Advertisement* the better. But to condescend to such as do use it, and shew them that it does not diminish enough.

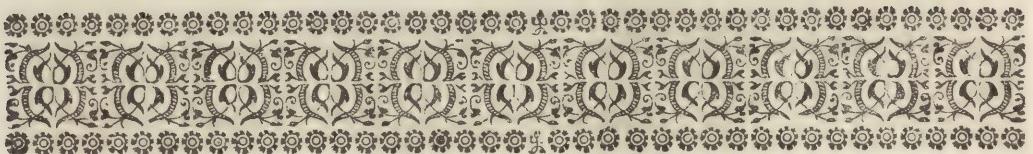
Having drawn Perpendiculars from the Angles of the Plan to the terrestrial Line, as in the preceding Cases, a Perpendicular is to be made on one Side, as A B, to receive the Intersections of the Parallels drawn through all the Angles. Thus, the first Angle being plac'd on the terrestrial Line of 2 and 7, I draw a Parallel through both, cutting the Perpendicular in C. After the same manner, the Angles 3 and 6 give the Intersection D, and 4 5 the Intersection E. This Line A B, thus divided, must be set off on the Base-Line of the Plan to be diminish'd, beginning to put the Point B in F, as in the Figure. Then making the other Divisions C D E, and from these drawing Lines to the Point of Distance O, from the Intersections of the extreme Ray draw Parallels to the terrestrial Line, and where these cut the Rays that bear the Numbers of the Angles, Points are to be made, which, being join'd by Right Lines, will give the Figure desir'd. As to the Thickness, or List, 'tis to be made after one of the preceding Manners.

1 Fig.



2 Fig.





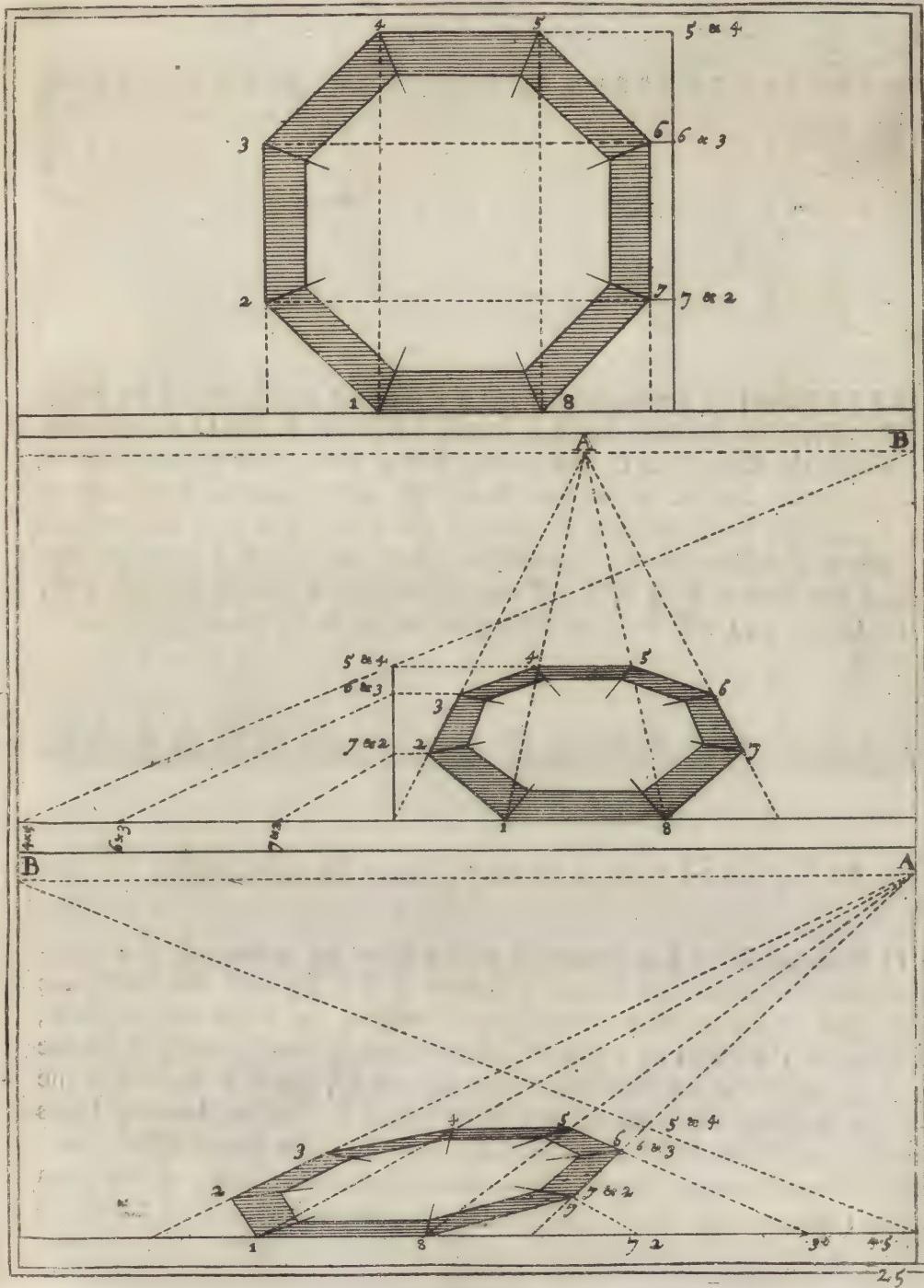
Of the Octogon, or Eight-Angle.

THE Octagon is form'd of a Circle, divided into eight Parts, of forty five Degrees each, the Divisions whereof, Lines being drawn, will form an Octagon, that is, a Figure of eight Angles, and as many Sides. The Rules already deliver'd, shew abundantly how it is to be put in Perspective, whether for a Front or a Side View. I shall only observe here, that the Front-Plan is to be diminished according to *Advert. VIII.* and the Side-Plan according to the *VIIth.* The Point of View is A, and that of Distance B. The rest is too obvious to need an Explanation.



PRACTICAL.

25



25



Another Method for the OCTAGON.

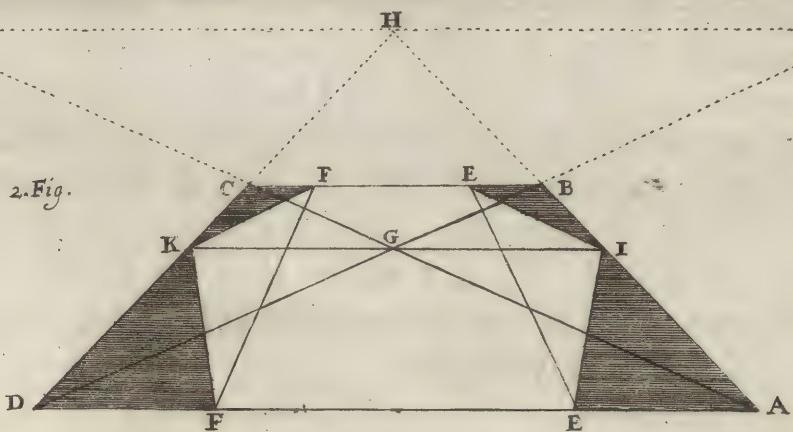
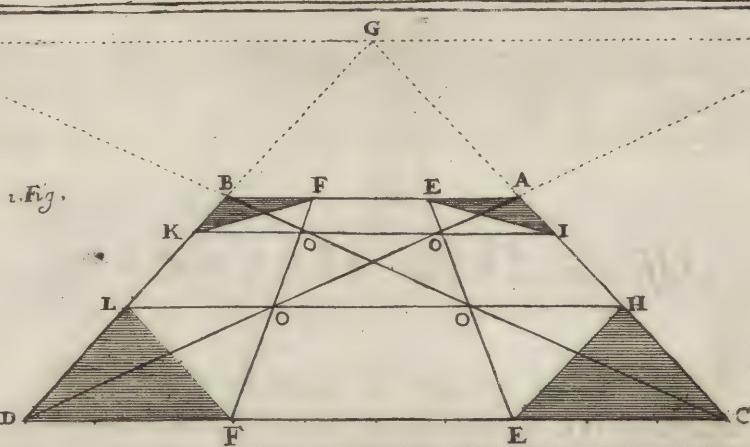
THIS Method of conducting the OCTAGON was invented by *Serlio*. The Practice is thus; having found a Square A B C D the ordinary Way, divide the Base-Line C D into ten Parts, and, leaving three on each Hand; from the third of either Side E and F, draw Lines to the Points of Sight, G, and through the Intersections of those Lines with the Diagonals O O, draw Parallels to the terrestrial Line, cutting the Sides of the Square in the Points H I K L: Then joining the Points E H, I E, F K, L F, by Lines, you will have an Octagon, as in the preceding Figure.



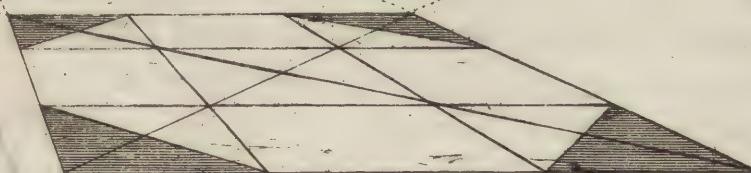
Of the HEXAGON, or Six-Angle.

THE same *Serlio* has contriv'd a like Way of managing the HEXAGON. Suppose, as above, a Square A B C D, and the Base-Line A D divided into four Parts, from one of which, on either Side E and F, draw Lines to the Point of Sight H; then through the Intersection of the Diagonals, which is the Middle of the Square G, draw a Parallel to the Base-Line, cutting the Sides of the Square in I K; lastly, drawing Lines through these Points E I E, and F K F, there will be found a Hexagon.

I shall say nothing of the Octagon view'd side-wise; since, as has been so often repeated, the Method is the same as for that view'd in front.



3. Fig.





Of the Double OCTAGON.

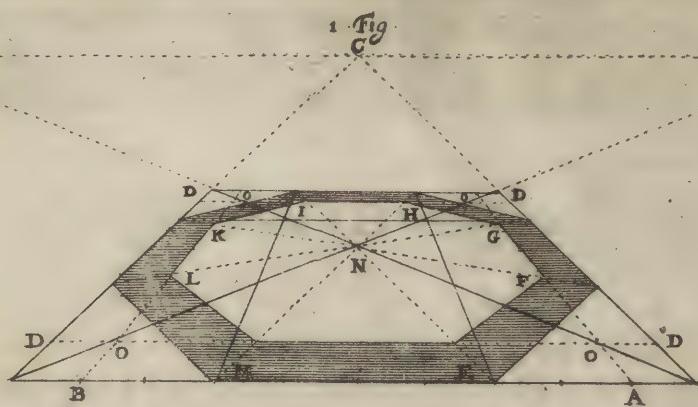
S UPPOSING a single Octagon already made, if 'tis required to have it double, or to give it a Thicknes, or List, proceed thus : Set the Breadth or Thicknes you are willing to give it, within the Square comprehending the Octagon, as here A B ; and from these Points draw Lines to the Point of Sight C ; and where these Lines cut the Diagonals, as in O O , draw Parallels D D , which will form a sort of Band round the Square ; lastly, draw occult Lines from Angle to Angle, intersecting each other in N ; and where they cut the Lines of the inner Square, viz. in the Points E F G H I K L M , will be the Bounds of the inner Octagon.



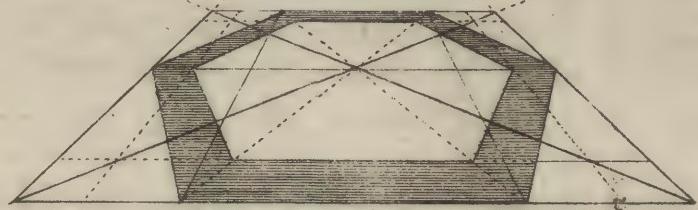
Of the Double HEXAGON.

T HE same may be done with a Hexagon drawn in a Square. It would be needless to repeat Particulars, since the Figure will clear any Doubts that may arise.

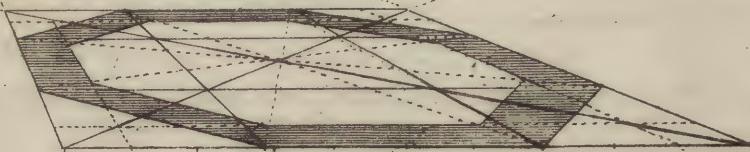
The Octagon view'd Side-wise, is managed precisely as that viewed in Front; the Point of Sight is A, and that of Distance B.



2 Fig



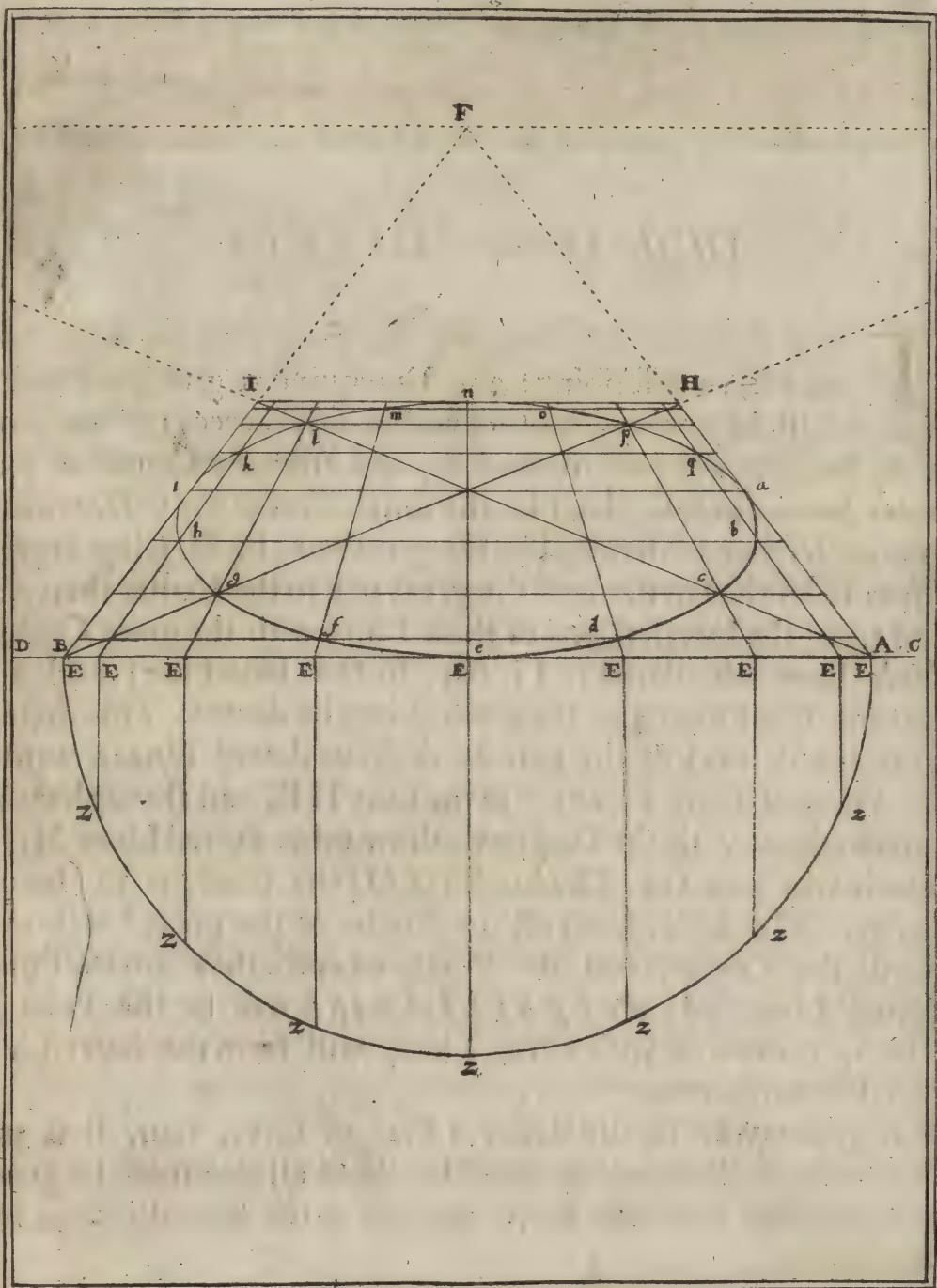
3 Fig.





Of the CIRCLE.

THE more Sides a Polygon has, the sooner and the easier is it converted into a Circle. For this reason *Serlio* directs a Semi-circle to be drawn, and the Circumference thereof to be divided into any number of equal Parts at Pleasure; for the more Divisions, the more perfect the Rotundity: Thus the Semi-circle A Z B is here divided into eight Parts, which give sixteen for the whole Circle; then from the several Divisions Z Z, &c. Perpendiculars are rais'd to the Base Line in the Points E E, &c. this done, the two Diagonals are to be drawn to the Points of Distance, which are here remov'd beyond the Compass of the Plate, but which are to be suppos'd, as usual, in the Horizon: Thus you get a Square A H I B. And this Square thus form'd, draw Lines from all the Points E towards the Point of Sight, as far as the Line H I, and thro' the Intersections of those Lines draw Parallels; then, beginning in the Middle of one of the Sides of the Square to make a Point, as *a*, and another Point *b* in the opposite Angle, as if you were about to draw a Diagonal; and proceeding thus to make Points from Angle to Angle, according to the Direction of Diagonals, as *a b c d e f g h i k l m n o p q*, these Points will form a perfect Rotundity; so that connecting them together by crooked or circular Lines drawn by the Hand, you will have your Circle in Perspective. 'Tis necessary People who deal in Perspective have this Rule of diminishing Circles very familiar to them, by reason of the frequent Use thereof in Columns, Vaults, Arches, Apertures of Doors, Windows, &c.

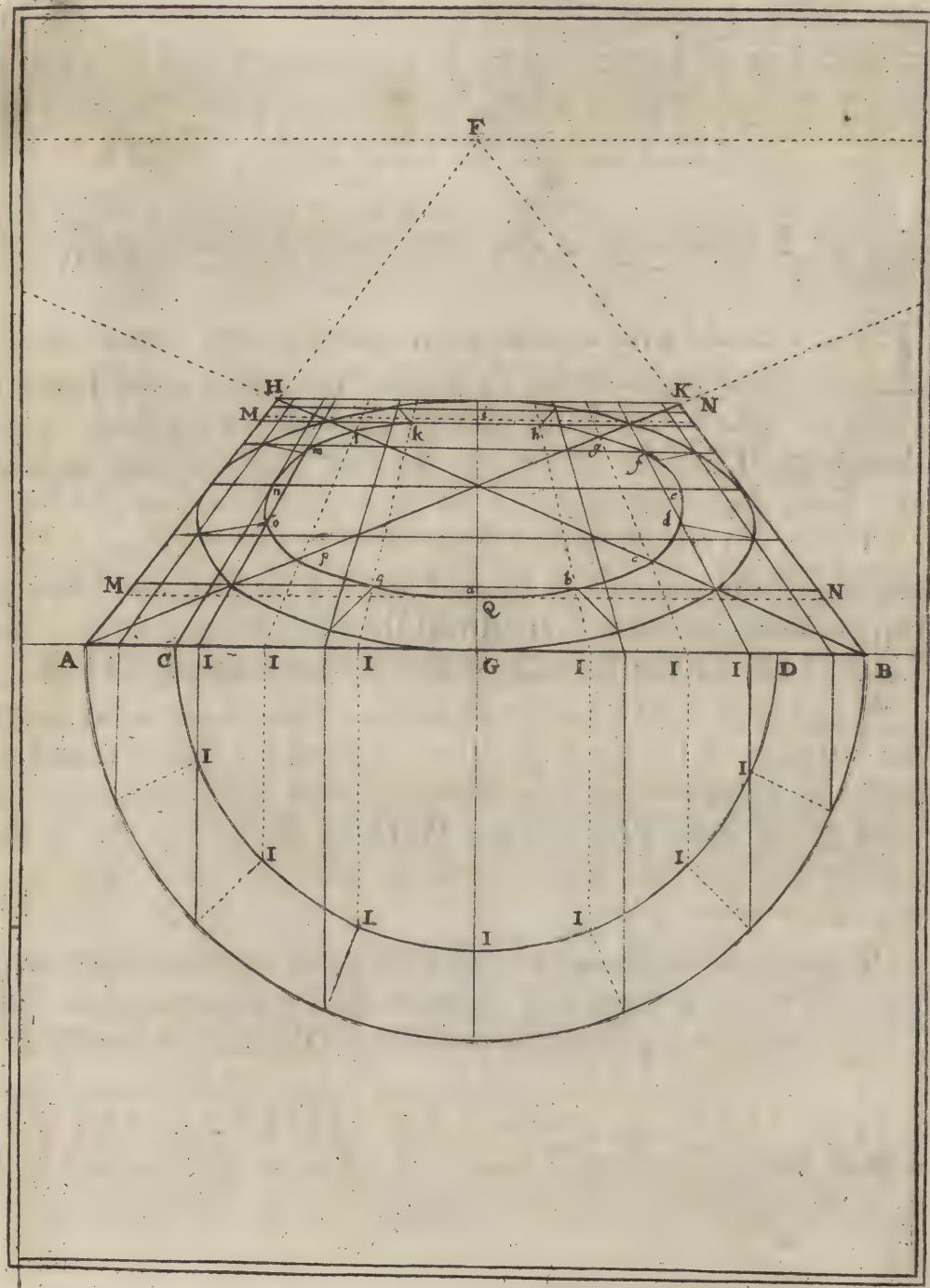




Of the Double CIRCLE.

THE first Circle is supposed the same that we have just now been describing; and 'tis requir'd to give it a Thickness, or Lift, by making another within-side thereof: Thus, give it any Breadth at Pleasure, as A C, and from the Center of the outer Semi-circle G, describe the inner Semi-circle C D, which you are farther to divide, like the great one, by drawing occult Lines from the Divisions of the great one to the Center thereof: and from the Intersections of those Lines with the inner Circle, draw Perpendiculars II, II, &c. to the Base-Line; and, to prevent Confusion, let these last Lines be dotted. This done, from the Points I of the Base-Line draw dotted Lines towards the Point of Sight F, as far as the Line H K, and through their Intersections, with the Diagonals draw other dotted Lines M N, which will give the Thickness (G Q) the Circle is to have. Lastly, draw Lines from all the Angles of the great Circle towards the Center, and the Points wherein they intersect the dotted Lines *a b c d e f g h i k l m n o p q* will be the Points, which, connected with curve Lines, will form the inner Circle's Circumference.

A Person who should desire a Plan of three, four, five, or six Circles in Perspective, must lay them all down in the geometrical Plan after the same manner as the second is done in this Example.



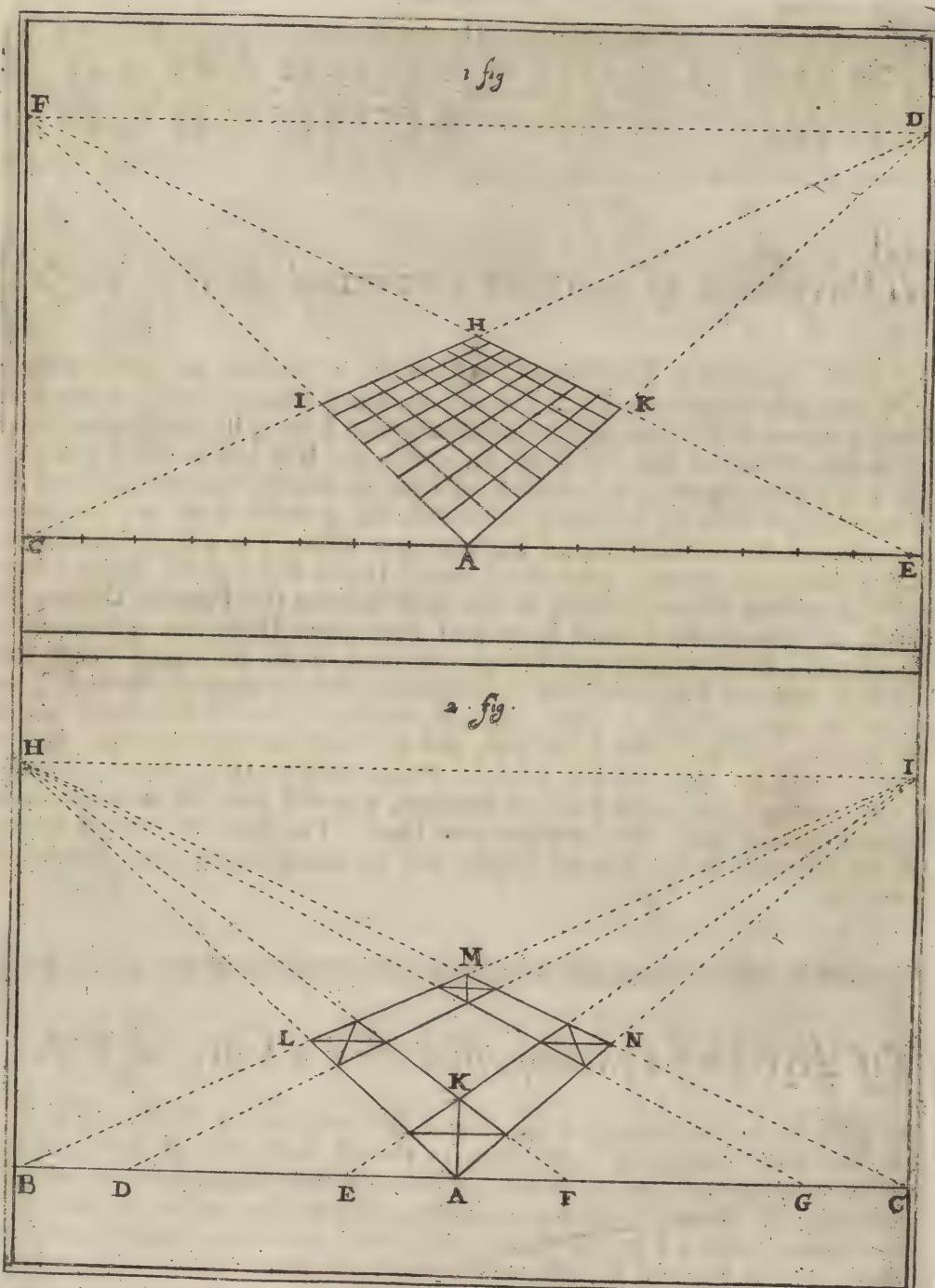


A P L A N of a Square view'd Angle-wise.

IF it should be required to draw a Square view'd by an Angle directly opposite to the Eye, there is nothing more requir'd than to follow the Rule already laid down; which is, to double the Diameter A B upon the Base Line, as here in A C, and from the Points A and C to draw two Lines to the Point of Distance D, then to set off the Measures of the Line A C on the Base Line towards A E, and from E A to draw Lines to the Point of Distance F, then will the three Intersections of the Lines H I K be the Bounds of the Square desired, A I H K.

When such a Plan is to be divided into several Parts, lay down the Number of Divisions required between the Points C and A, and the same Number on the other side A E; and from all these Points draw Lines to the Points of Distance: As in the present Figure, which has eight Squares on each Side, and sixty-four in all.

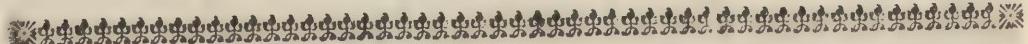
If in the same Plan, thus view'd by the Angle, it were only required to have four little Plans in the four Corners, as four Lodges, Columns, Trees, or the like Objects, set the Width thereof on the Base Line, within the Side of the Square A B or A C, D and E being between A B, and F G between A C; from which Points drawing Lines to the Points of Distance H I, their Intersections will give the four Plans K L M N required.





A Pavement of SQUARES viewed by the Angles.

NOW we are about Places viewed angle-wise, it may not be amiss to shew how a Pavement of a Hall, Church, or other Place is to be conducted. Having drawn the Horizon parallel to the terrestrial Line A B, the Point of Sight C, and the Points of Distance D and E, divide the Base into as many Parts as you would have Squares; then draw Lines from the Extremities thereof A and B, to the Point of Sight C, and from the same Points A and B draw two Diagonals to the Points of Distance D E, the Points of Intersection F G will give the Square of the Hall, and through them the Line of Depth H I is to be drawn; then draw Lines from all the Divisions of the Base Line to the Point of Distance D and E, and between the Rays A B you will have your Desire; as appears from the Figure. But here arises a Difficulty, viz. how to fill the vacant Space B B and G I, A A and H F, with the same Squares; for 'tis suppos'd the Base Line cannot be prolonged any farther. On such Occasion, take the Measure of one of the Squares, as G K, on the Line F G, and set it off on the same Line H I as often as 'twill go, and you will have the Points L M N O P Q and R, through which drawing Lines to the Point of Distance, you will have the same Squares as before; such are those here marked with Dots. The same Method of setting off the Measures on the Line of Depth, will be exemplified in other Pavements hereafter.

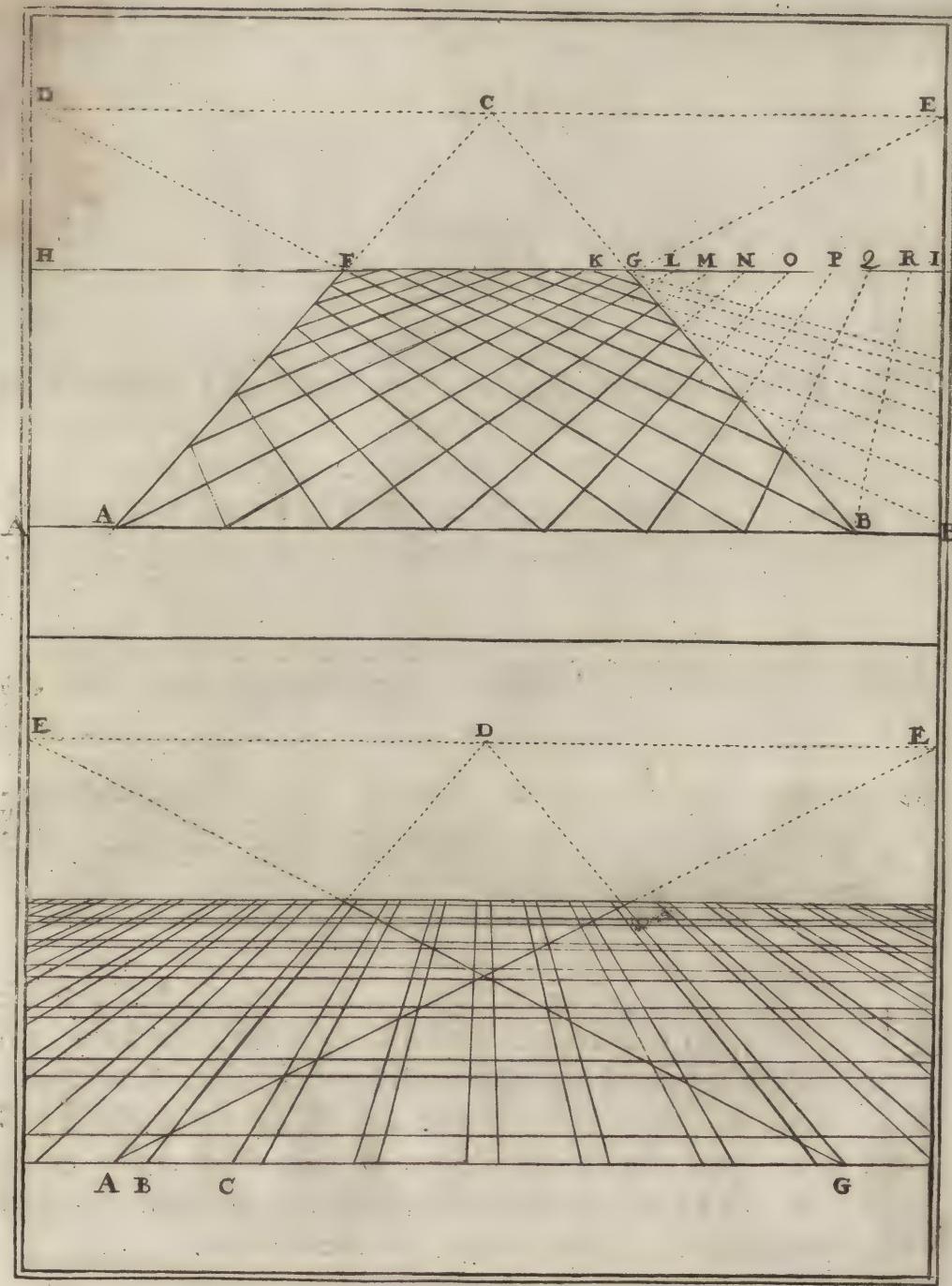


Of SQUARES encompassed with a List, or Fillet.

THE Method of managing this second Pavement with a Band around it, is the same with that of single Squares viewed in Front; we shall therefore decline to waste any Time in teaching it, since we have already given so many Figures thereof. It may be proper, however, to add, that the Base Line is to be divided into unequal Parts, as A, B and C, and Lines to be drawn from all these Divisions to the Point of Sight D, and through the Points where these are intersected by the Diagonals A E, and G F, Parallels to the Base Line are to be drawn; as in the Figure.

PRACTICAL.

31



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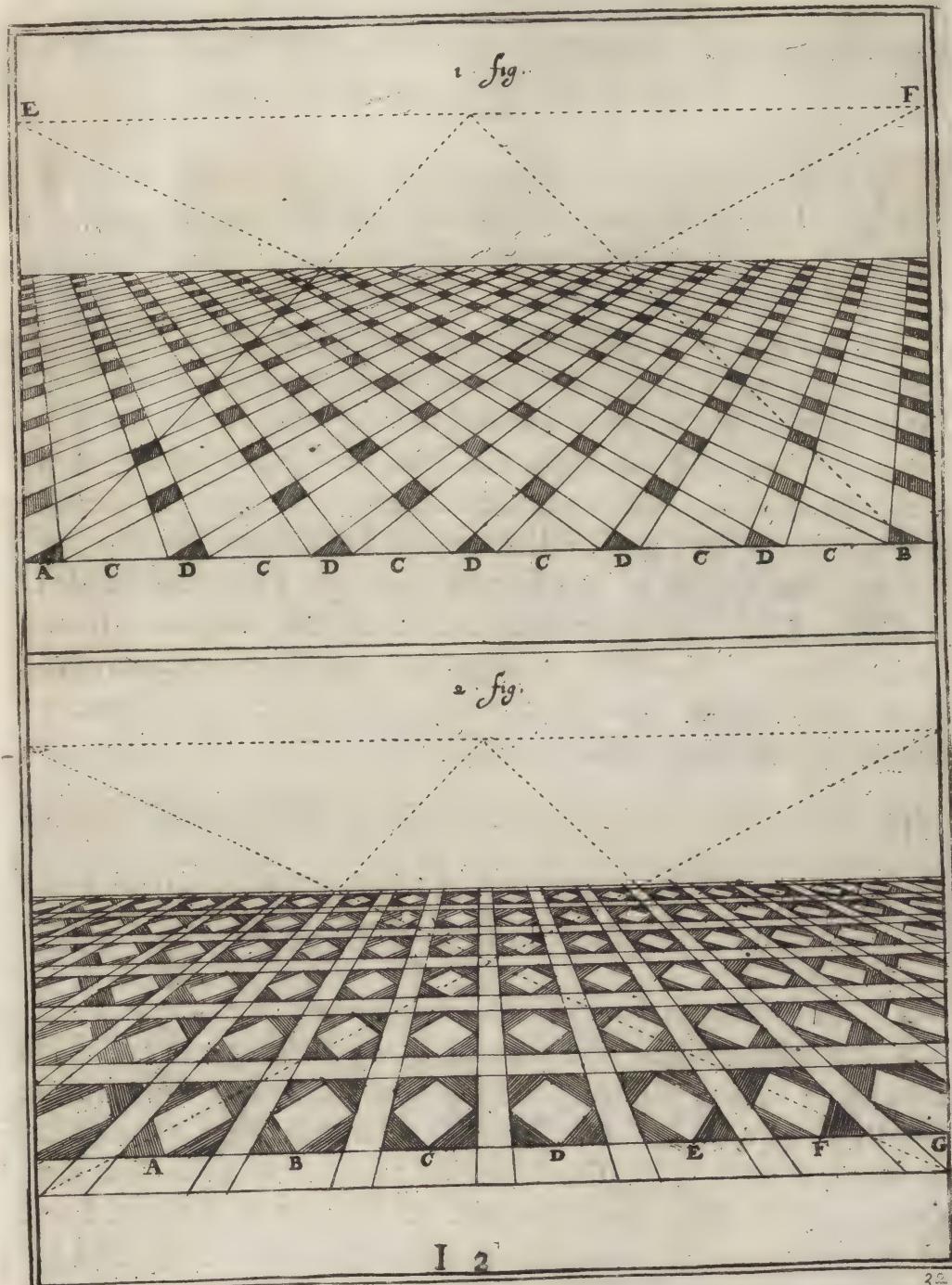
Pavements view'd Angle-wise, encompass'd with a Band or Fillet.

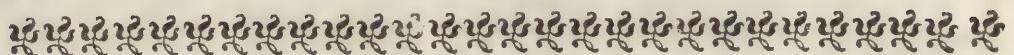
FOR such kind of PAVEMENT, the Base Line A B is to be divided into unequal Parts, the largest whereof are to be for the Squares, and the smaller for the Band or Fillet; and from all these Divisions, Lines are to be drawn to the Points of Distance E F: As has been already directed in single Squares.



Pavements of Squares view'd in Front, encompass'd with Lists, or Bands, whose Squares are divided by the Angle.

FOR this fifth kind of Pavement the same Method is to be taken as in the second, by dividing the Base Line into unequal Parts; but to make the Square that is seen Angle-wise in the Middle, the largest is to be divided into two, as A B C D E F G; from the several Points whereof, Lines are to be drawn to the Points of Distance, the Intersections whereof will give the Square, or Lozange, in the Middle.





Pavement of Squares *view'd Angle-wise*, with
Chains of Squares in Front.

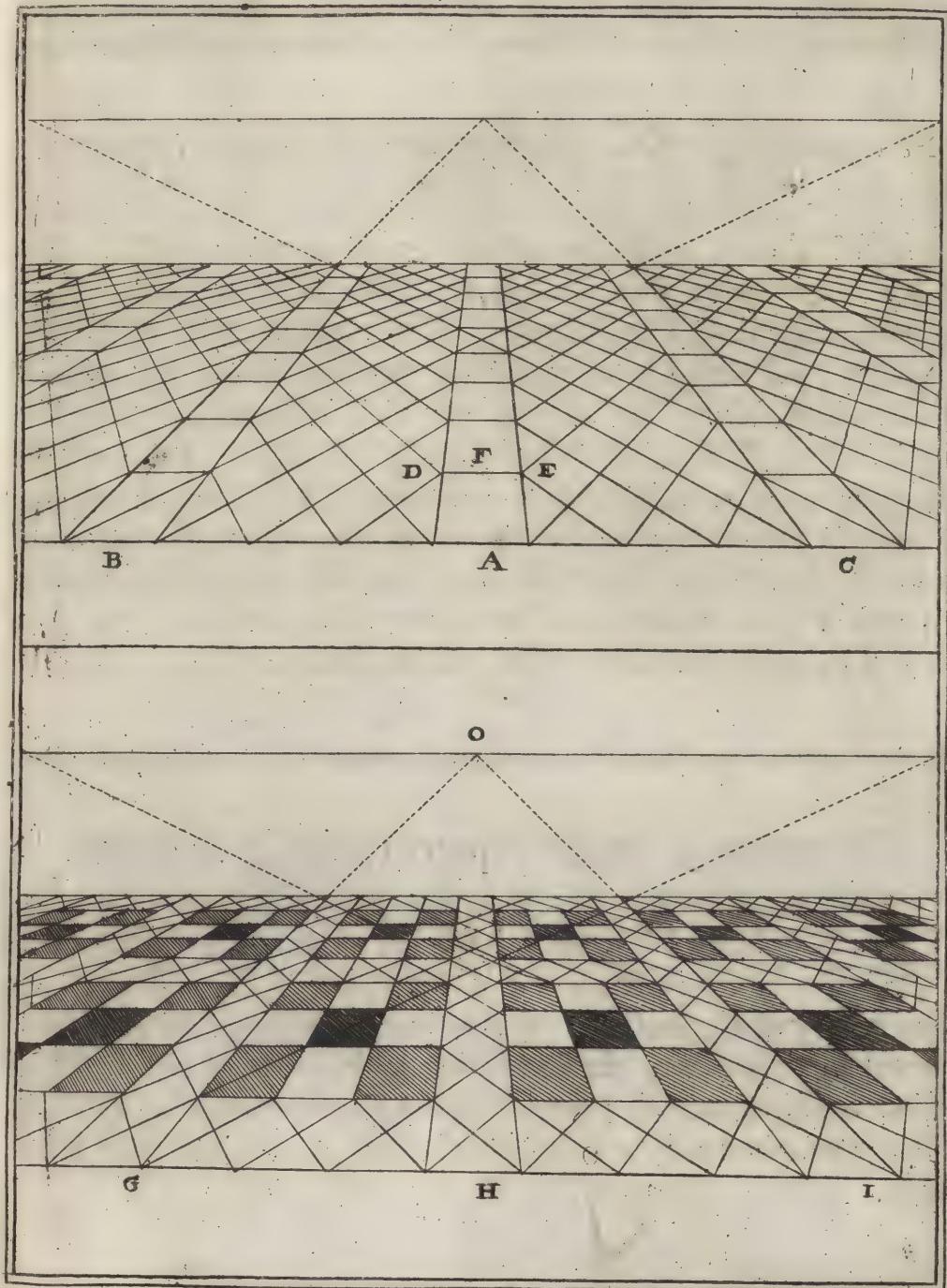
WE suppose the Perspective, or Diminution of the Square, by drawing the Line of Depth, to be already done, that we may save the Trouble of too frequent Repetitions in the ensuing Pavements.

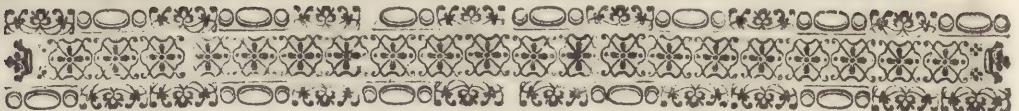
To manage this sixth Sort of Pavement, divide the Base Line into equal Parts, and from some of them, as A B C, draw Lines directly to the Point of Sight, and from all the rest draw Lines to the Point of Distance, but without marking them thro' the Chains. After all such as are thus view'd by the Angle are thus drawn, Parallels must be drawn for the rest, meeting the Angles of the former; *ex. gr.* From the Angle D and E the Line F to be drawn, and of all the rest, as is shewn by the Figure: Care still to be taken, that there be always the same Number of Squares between the Chains; as here we have three between A B.



Pavement of Squares in Front, with Chains of
Squares *Angle-wise*.

THIS seventh Sort of Pavement is perform'd much after the Manner of the preceding, by dividing the Base Line into equal Parts, and from the Divisions drawing Lines to the Point of Sight, to form the Bands or Chains G H I; yet there is somewhat more in it, Care being required to make the cross Chains of the same Breadth as the others that tend to the Point of Sight O, and that there be the same Number of Squares between the Vacuities. The rest is obvious enough.





Pavement of Octogons intermix'd with Squares.

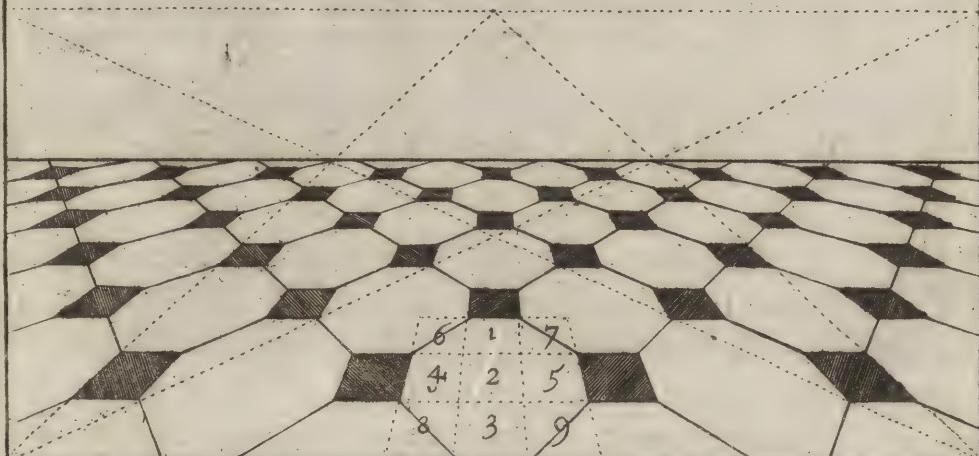
WE should never have done, were we to give all the Varieties of Pavements; a Person of Fancy that Way would easily invent an Infinity. This seventh Way is obvious enough; all we add it for, is, to open the Mind, and furnish Occasion for the contriving of others. All that is required is to divide the Base Line into a Number of Parts, whereof the Squares are to be formed, as already directed: Of which Squares a certain Number is to be taken, as here nine, five whereof are full, and the rest only Halves; the full ones give the Inside of the Figure 1 2 3 4 5, and the Diagonals of the rest, 6 7 8 9, give the Sides: The rest is evident.



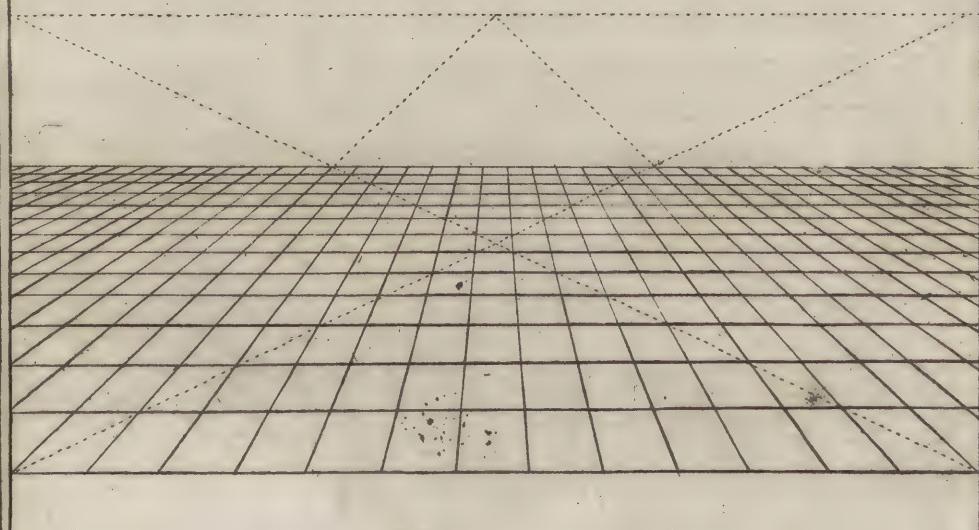
Pavement of single Squares view'd in Front.

THIS Form I have put the last, not as being the most difficult, for in Reality it is the easiest of all, and the very Beginning of Perspective, but to intimate that it is the most useful and necessary, the rest being seldom added but by Way of Ornament, and this serving as the Foundation whereon any Thing is to be rais'd, to be made appear: As will be shewn hereafter.

1. fig.



2. fig.





Plan of a GARDEN in Perspective.

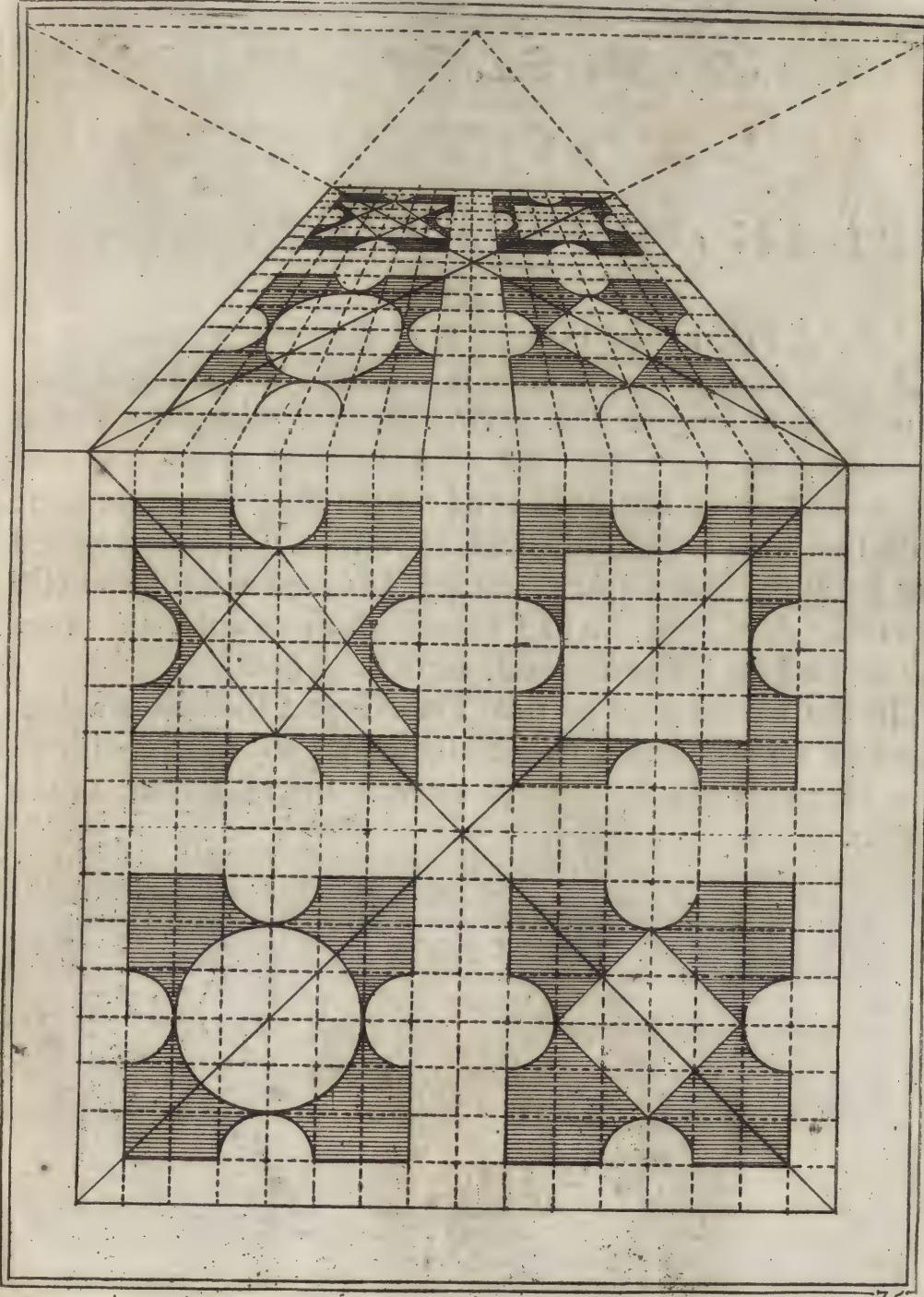
WHAT we have been observing, is confirmed by this Plan : For, drawing Lines from all the Divisions on the Base Line to the Point of Sight, the Diagonals will give the Depth of the whole Plan, and the Diminution of all the little Squares. Lastly, setting off the Alleys, Figures, &c. from the correspondent Quantities in the geometrical Plan, the whole Parterre will be found in Perspective ; as is shewn in the Figure.

Let the Plan given you to diminish, and put in Perspective, be of what Sort soever, the readiest Way will still be, to draw a Square about it, and divide that into several lesser Squares. For putting the grand Square, with all the lesser ones, in Perspective, by the ordinary Rules, you have nothing farther to do, but take Care that every Thing take up the same Number of little Squares in the diminish'd Plan as in the geometrical one, and the Figure of the one will be found in the other.



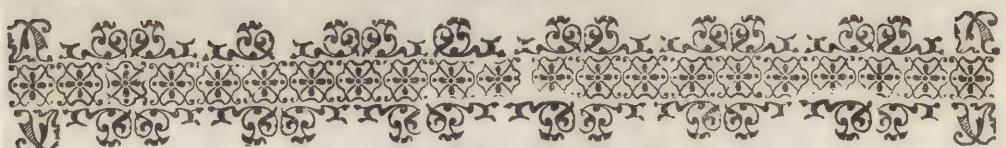
PRACTICAL

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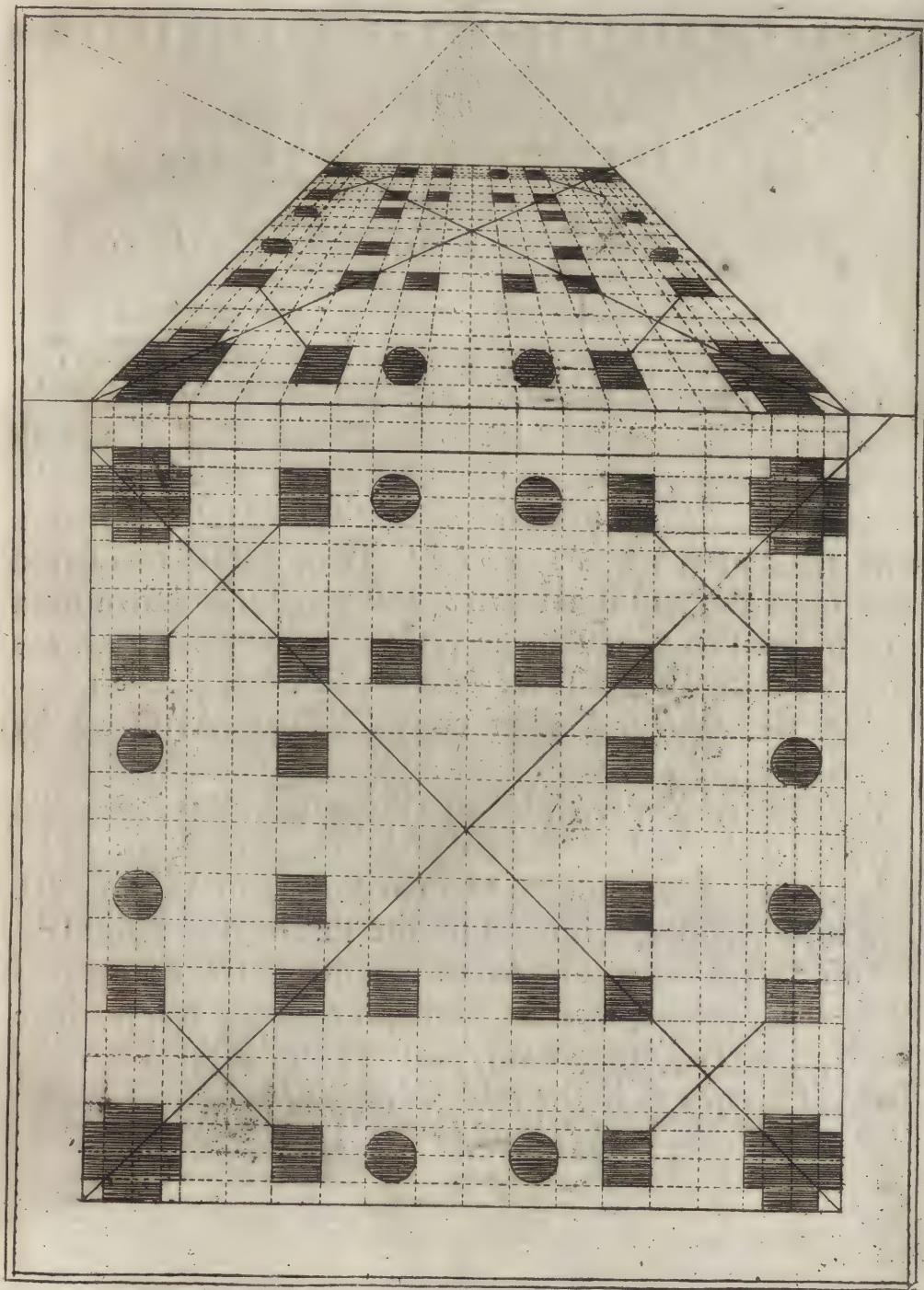


PLAN of a BUILDING in Perspective.

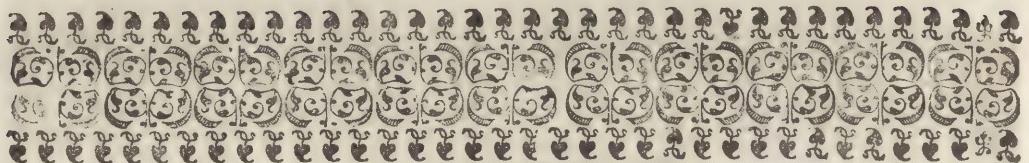
S ERLIO, in his Treatise of PERSPECTIVE, sets a great value on this Method of putting Plans in Perspective, as a Thing of singular Use in Architecture, whereby a Person is enabled to shew one Part of a Building rais'd, and the rest in Platform ; but his Method for Buildings being the same with that we have already laid down for a Garden, we need not say any Thing farther thereof : The Figure is sufficient for the rest. And from this one Figure Measures are easily taken for any other, either more easy or difficult ones.

In the second Part of this Treatise you shall have a Method of representing a whole House in Perspective, with all the Members and Apartments thereof, from the Roof to the Cellar.





K 2

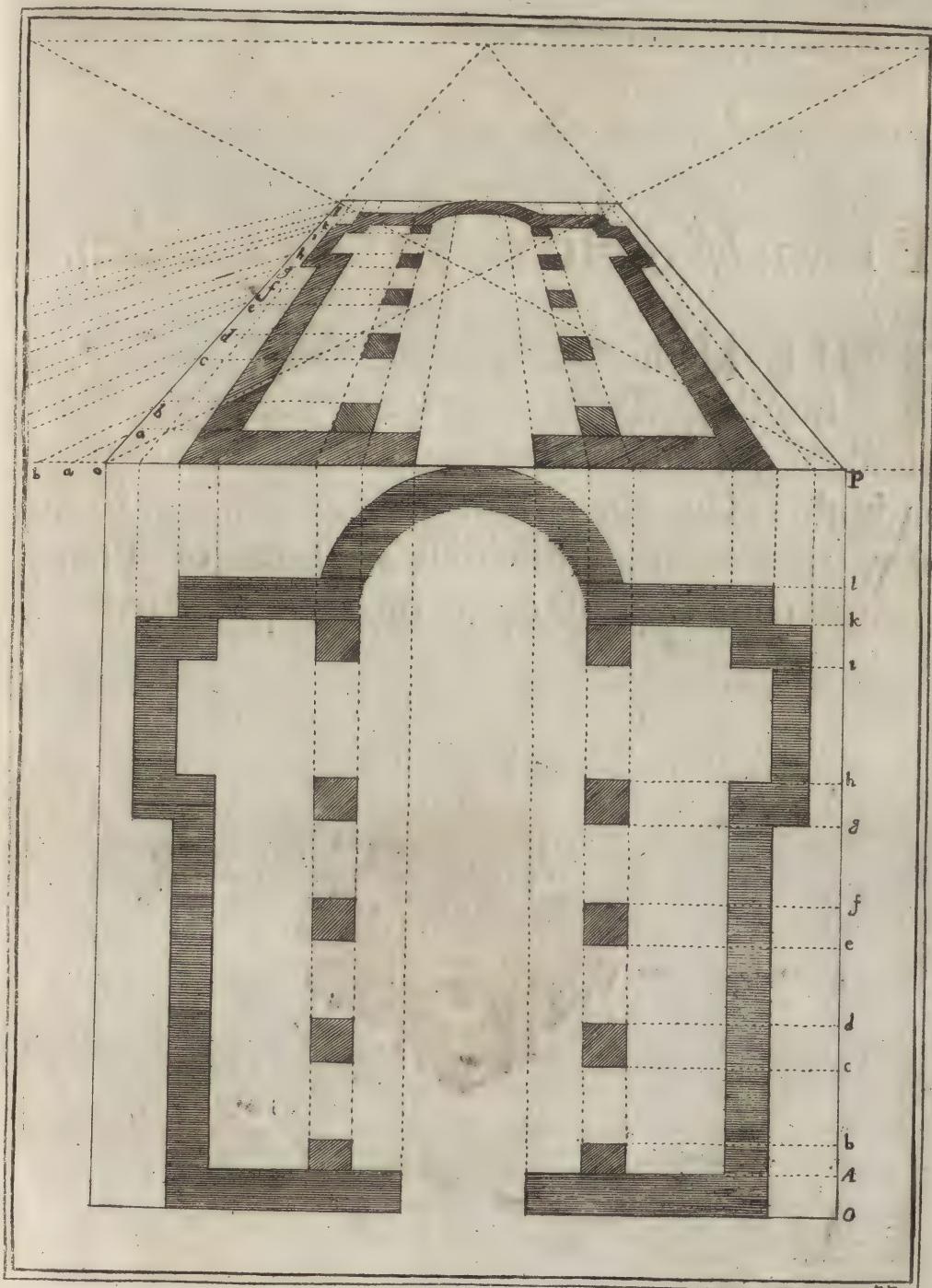


Plan of a CHURCH, in Perspective.

THIS Plan is conducted according to ADVERT. VII. That is, all the Sides perpendicular to the Base Line, as are here the Places of the Walls and Pilasters, are drawn to the Base Line, and from that Line to the Point of Sight; and all the other Sides parallel to the Base Line, as are here the Breadths, &c. drawn to a Line on one Side, O P, which thus shews the Points *a b c d e f g h i k l*. These Points transferred hence upon the Base Line as *a b*, &c. and Lines drawn from them to the Points of Distance, their Intersections with the extreme Ray, give Points for drawing Parallels through, exhibiting the Diminution of every Thing: As shewn by *a, b, c, &c.*

This Method of diminishing on the extreme Ray is practis'd by many; and yet such as would take my Advice, should let it alone, and rather follow the Method directed in ADVERT. VIII. where a Perpendicular is rais'd on the End of the Base to receive the Intersections, and to obviate the Defect of the present Method, which does not diminish enough, unless where the Points of Distance are very remote: For in that Case, the Effect is the same as in the other Methods.







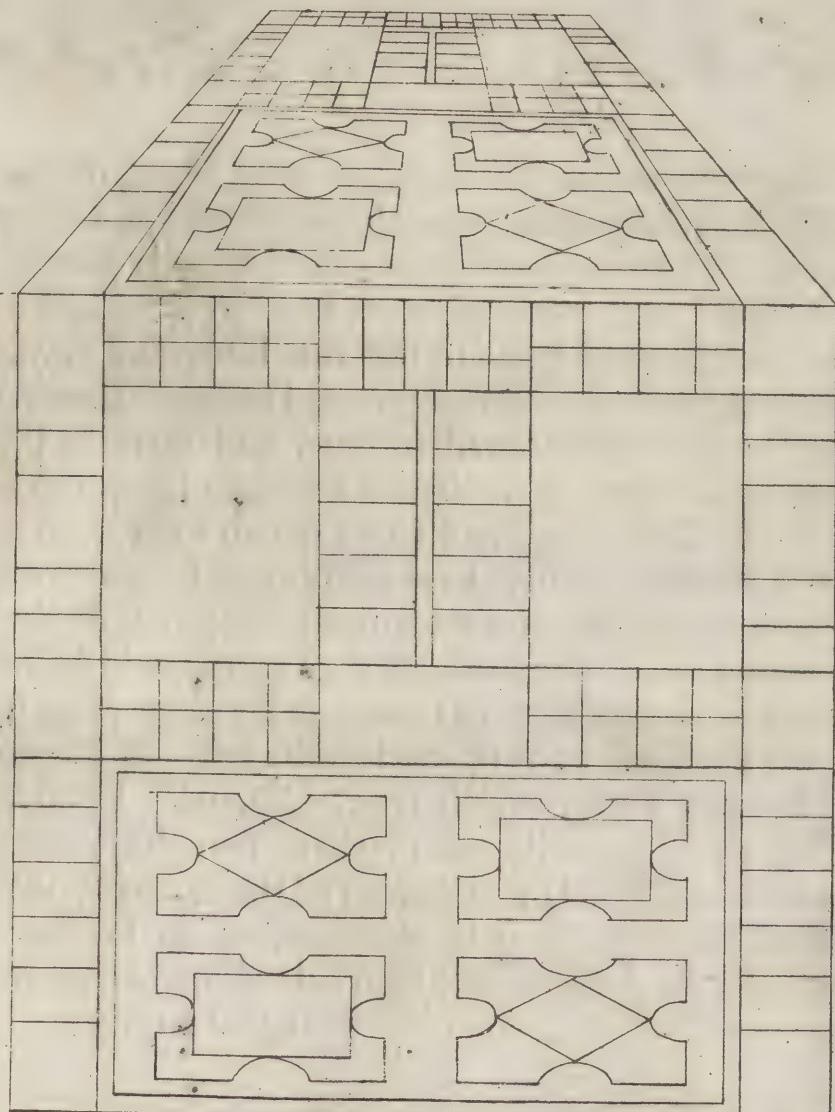
PLAN of a House with a Garden.

THE Method of putting this Plan in Perspective, is the same with that of the Garden alone ; so that what is there said may suffice for both. Our Design in putting it here, is, to shew, that one may diminish all Sorts of Plans, whether consisting of equal or unequal Parts.



PRACTICAL

38



38

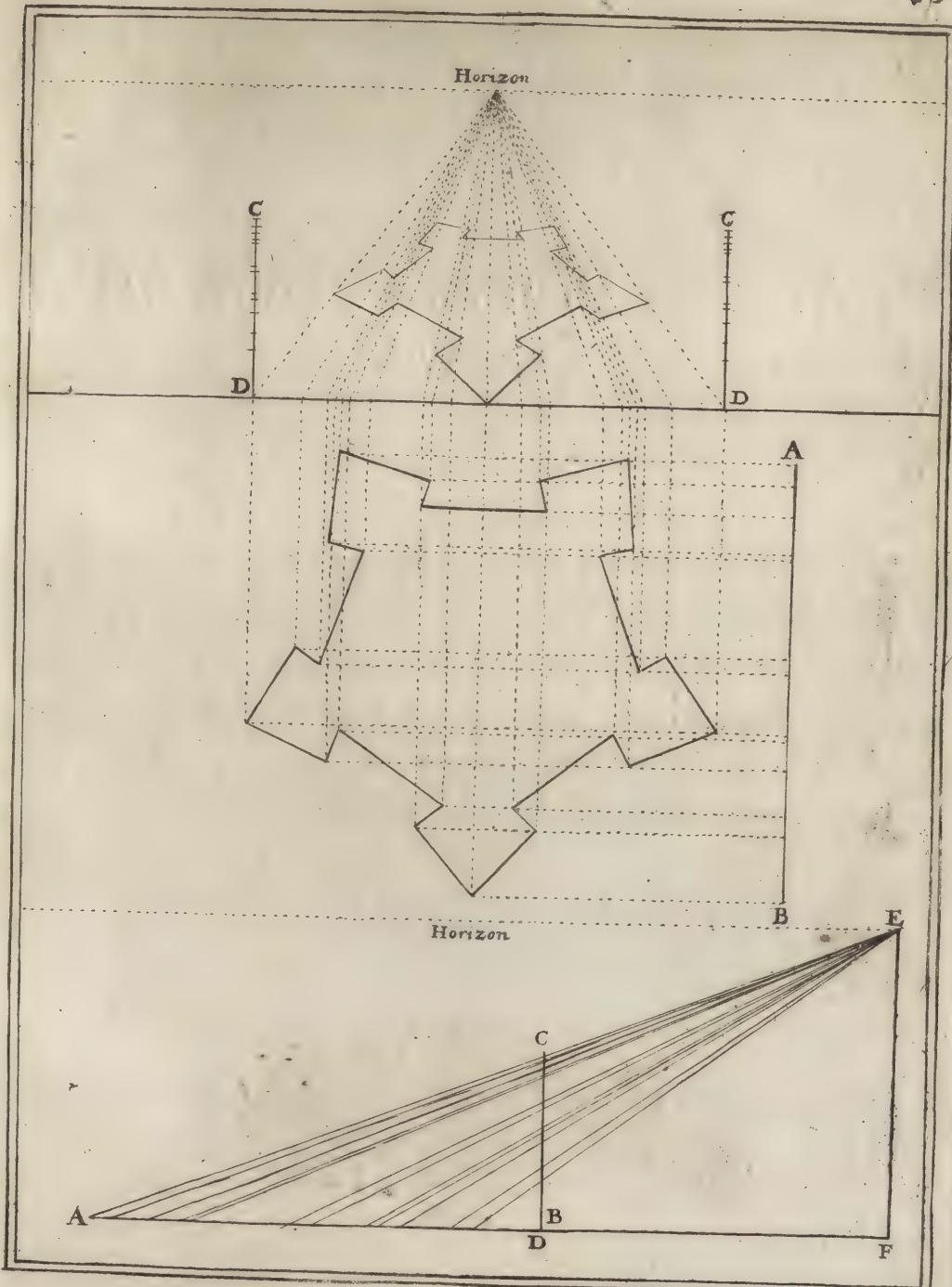


Plan of a FORTIFICATION, in Perspective.

To put a FORTIFICATION, or other Thing of the like Kind in Perspective, the VIth and VIIth ADVERT. are to be us'd. The same in Effect is the Method already laid down for the CHURCH and HOUSE, viz. by drawing Perpendiculars from all the Angles to the Base Line, and Rays from the Base Line to the Point of Sight, and from the same Angles drawing Parallels to the terrestrial Line, and marking the Divisions on a Side-line, A B. These Divisions being transferr'd thence to the Base Line, and Lines drawn from them to the Point of Distance, we shall have the Line of Intersections C D. But by Reason we have not Room here to put it on the Base Line we have added it underneath the Figure, as in A B. Lastly, having fix'd the Point of Distance in E; draw Lines thence to all the Divisions of A B, cutting the Line of Intersection C D in so many Parts; which Line, C D, with its Divisions, is to be transferr'd to the Bottom of the extreme Ray, or at least set on each Side, as D D; and from all the Points of the Line D C, draw Parallels, or only Mock-points, on the Ray proceeding from the Angle of the Plan belonging thereto. Which Points, connected by Lines, give the Figure required.

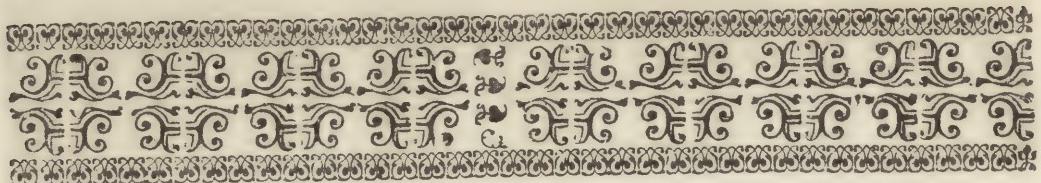
PRACTICAL

39



39

L



An Irregular Plan and Figure in Perspective.

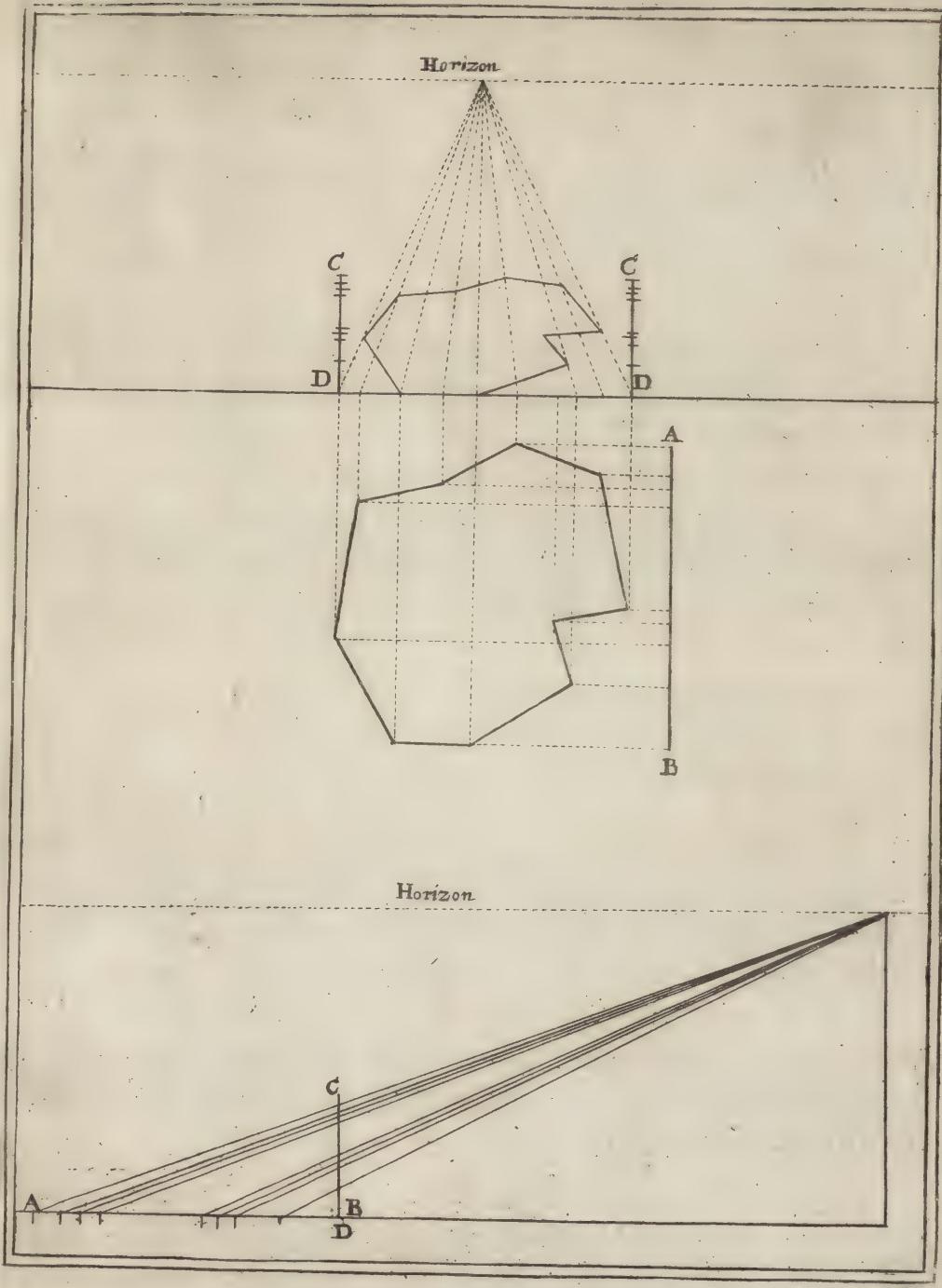
A MAN who can perform what is directed under the last Article, will find no Difficulty in any Thing else ; that being the most intricate of all Kinds of Plans in Perspective. It was judg'd, however, proper to add some irregular Thing, that might appear at first Sight to be Difficult, in order to shew that there is nothing but what may be diminish'd, in what View or Aspect soever it be.

4



PRACTICAL.

40



L 2

40



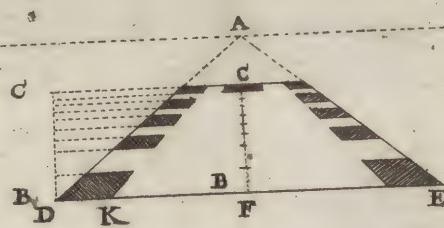
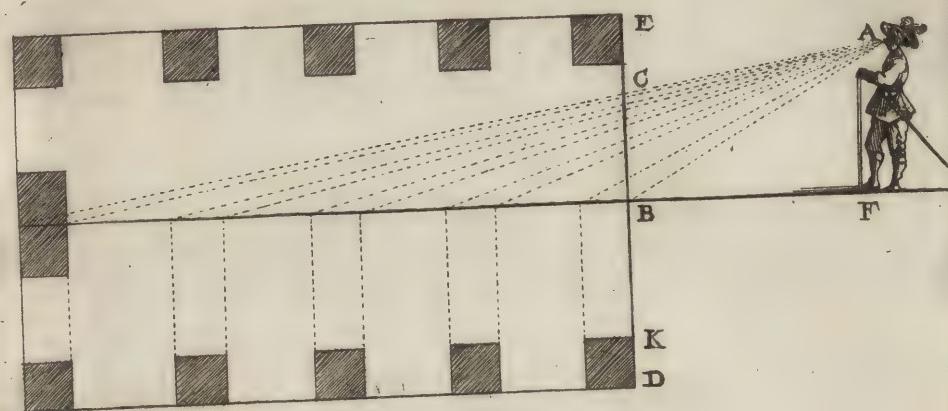
Another Plan of a CHURCH, in Perspective.

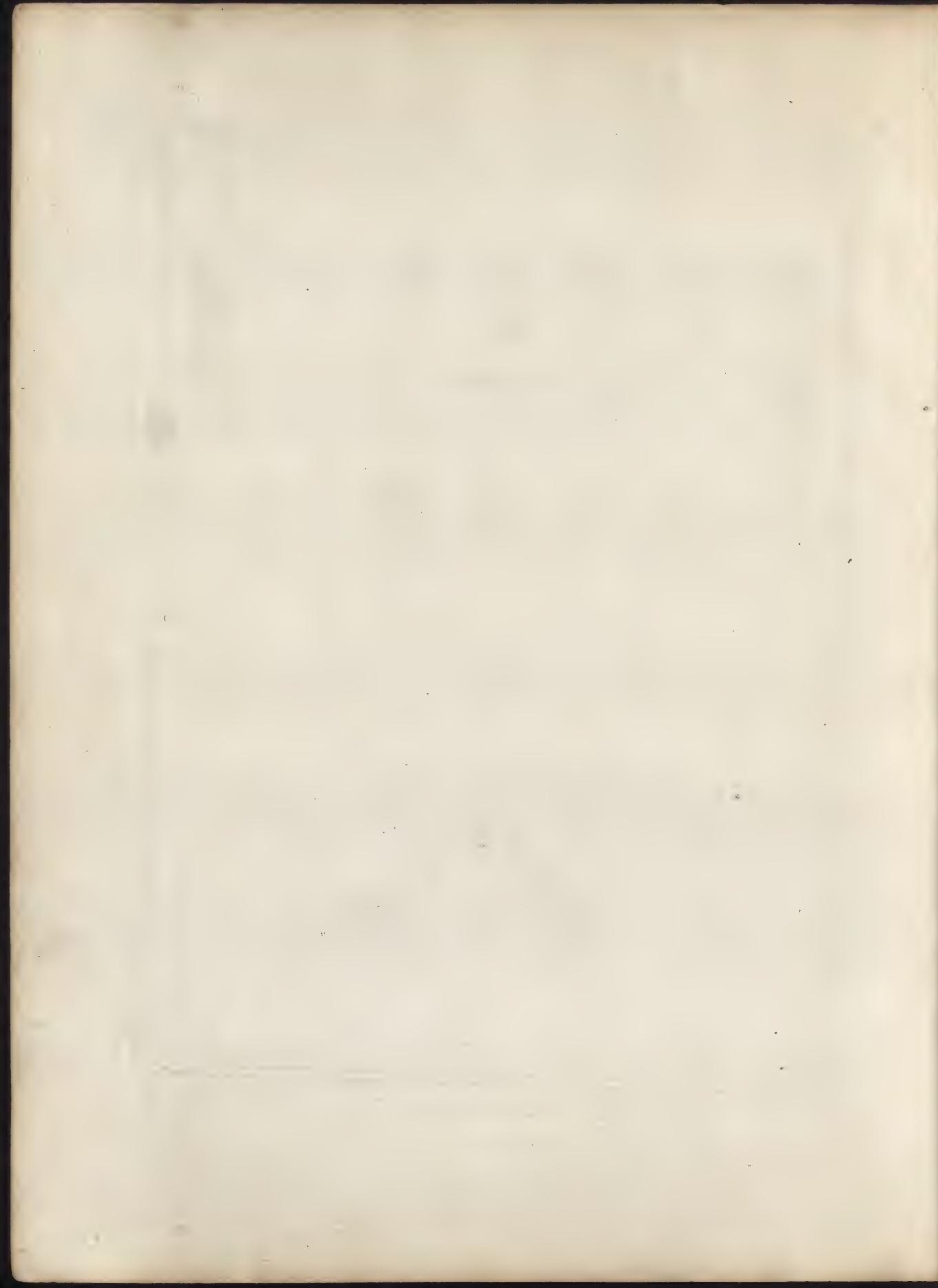
THE Manner of this Perspective should seem very different from what we have hitherto delivered, by Reason of the different Disposition; but that we own it a Thing done designedly, to shew that there are divers Ways and Manners, tho' all reducible to one. For this, in Effect, is the same with what we have already prescribed for Fortifications, irregular Figures, and other Plans, with this Difference, that the Parallels to the Base Line are there mark'd on a Side Line, and here, on a Line in the Middle of the Plan: But the same Effect is had from each Method; for drawing Lines from all the Divisions of the middle Line to the Eye A, you will have the Line of Intersection BC, which is upon what may be called the Base Line DE.

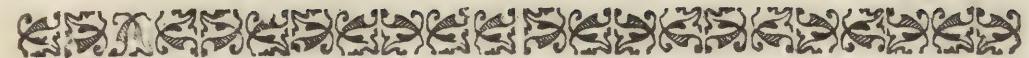
To put it in Perspective, transfer the whole Length of the terrestrial Line DE to any Place at Pleasure, as D E, and set off the Height of the Eye A F; then, putting the Line of Intersection BC either in the Middle, or one Side, draw Parallels to the Base Line thro' all the Divisions to the extreme Rays DA, EA, and set the Breadth of the Pilasters DK on the Base Line; then drawing a Line from K to the Point of Sight A, the Points wherein it intersects the parallel Lines will be the Widths of the Pilasters.

PRACTICAL.

41







R U L E S

F O R

E L E V A T I O N S.





Preliminary Instructions necessary to the following Methods.

WE fancy the Reader is by this Time sufficiently instructed in what relates to Ichnography and Planigraphy, considered as the Foundations of Orthography and Scenography.

Orthography, we have already defined, the Elevation of the Face or Front, &c. and Scenography the Elevation of the Whole. See the DEFINITIONS at the Beginning of the Work.

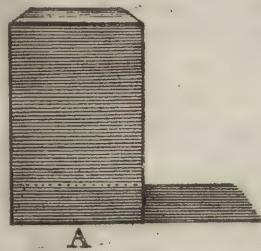
To make myself more intelligible to such as are not versed in the Use of those Words, we purpose for the future to call Ichnography, the *Plan*; the Orthography, the *Upright*, or *Elevation* of the Front; and Scenography, the *Elevation* of the Whole.

Before we proceed any farther, it is to be observed, that Elevations never give the Eye all the Angles of the Plan, and that the Quantity of Sides, or Angles, depends on the Aspect or View the Object is taken in: Thus, if it be viewed in Front, as the Figure A, it will only shew one Side, tho' the Plan have four; if it be viewed by the Angle, it will shew two, as B; but never more, in whatever View it be taken: We speak of Squares; for as to Objects of many Sides, they may shew three, four, five, and more,

Now Objects declining ever so little from the Point of View, are seen by the Angle, and of Consequence must shew two Sides: And still the farther they are removed from the Point of Sight, the more of themselves they shew; thus K E shews more of itself than C L, tho' their Thickness be equal.

Another Thing to be observed farther is, that what is parallel to the Horizon when the Object is viewed in Front, as C D E F of the Door in Fig. 1, becomes a visual Ray when the same Object is view'd a little obliquely: Thus CDEF, which in the upper Figure stands in Front, becomes a visual Ray in that underneath. And, on the contrary, what is a Ray in the upper, becomes parallel to the Base in the under. As to Perpendiculars, they are always perpendicular.

fig.



A.

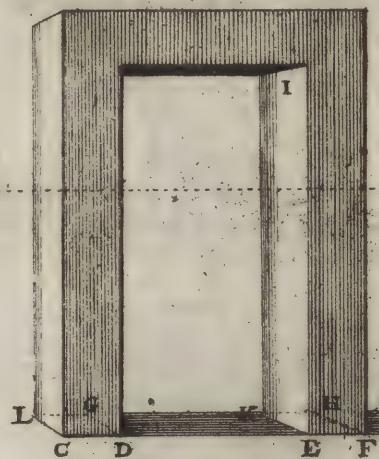
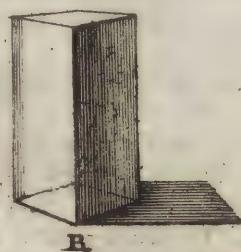
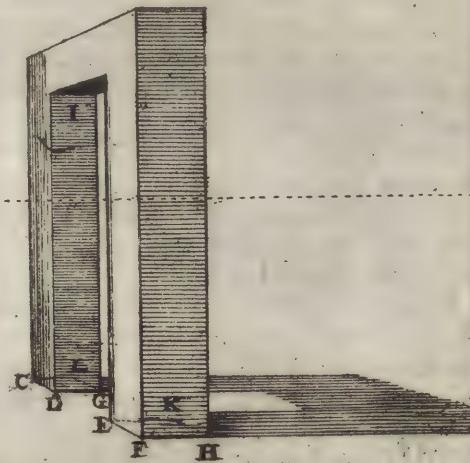


fig.



B.





Of the Line of ELEVATION, serving to give the Heights of all Kinds of Objects in all Parts of the Plan.

THE Use of this Line is of the last Importance, insomuch, that whoever is perfectly Master thereof will scarce meet with any Difficulty in any Kind of Elevation.

As in the putting Planes in Perspective we made use of the Base Line; so in Elevations, another Line is to be used, to direct us, and carry the proper Heights to all the Objects to be raised.

This *Line of Elevation* must be perpendicular to the Base Line A B, which is always the first Line of the Plan, and that next the Eye, and of Consequence the fittest to carry the Measures to the several Objects in the Plan. On this Account the Line of Elevation C D is raised perpendicularly on A B, as the other Lines in the Plan should be: Insomuch, that it is to be remembred as a Rule, that whenever, in the Course of this Work, mention is made of Perpendiculars, it is to be understood of Perpendiculars to the Base,

Since 'tis this Line of Elevation which is to receive and give the Heights of the Objects to be rais'd on the Plan, it must have the same Horizon with the Plan; for this Reason, from the Foot of this Line (which is placed either on the right or left) a Line is to be drawn to some Part of the Horizon, tho' to what Part does not matter, the Effect being the same in all. In this Figure, the Line of Elevation is C D, and from C, the Line is drawn to the Point of the Horizon in E; or it might be drawn to the Point of Sight, if one pleased. We have here put the Line of Elevation on either Side, and the Point different in each, to shew that it will answer any where.

If from the Point H, which is in the Plan of the second Figure, you would raise a Line of two Foot Height, set two equal Parts on the Line of Elevation, which you hold equivalent each to one Foot, such is here C F; and from C drawing a Line to E, you will have an Elevation of two Foot between the two Lines C and F.

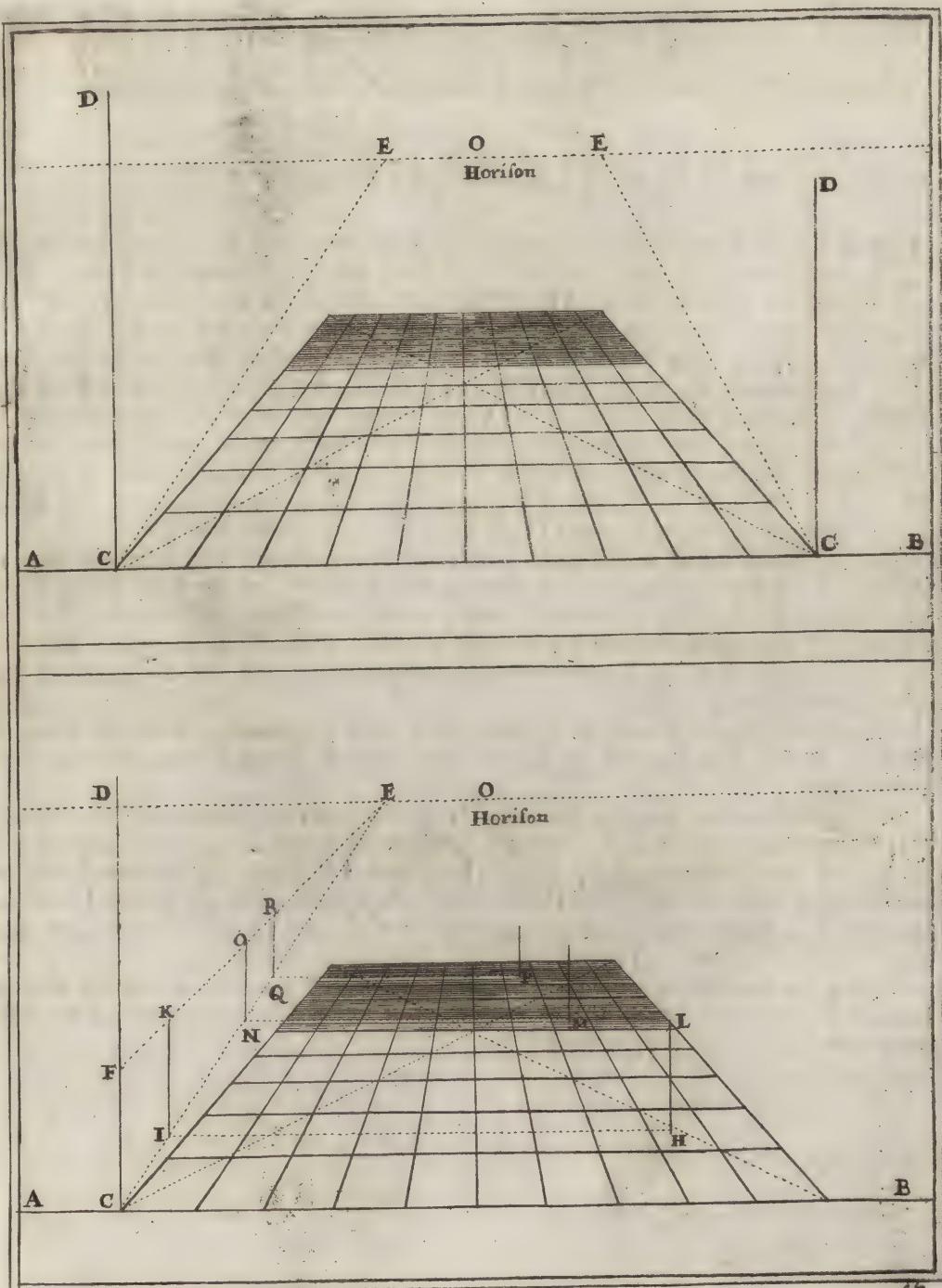
Now, to give the same Height of two Foot to a Line raised from the Point H, from D draw an occult Line parallel to the Base Line, till it meet the Line C E in the Point I; then from the Point I erect a Perpendicular I K: This will be the Height of the Line required, which is to be taken hence in the Compasses, and set off from H to L.

If a Line likewise two Foot high were required to be drawn from the Point M, the same Operation being repeated, you will have the Perpendicular N O, which will be the Height required from M. Lastly, performing the same for the Point P, you will have the Perpendicular Q R, for the Height of a Line of two Foot from the Point P.

The same Rule will give a Height of 3, 4, 5, 10 or 20 Foot; all required being to set such Heights on the Line of Elevation, from those Heights to draw Lines to the Point in the Horizon, as E, and to proceed with the rest as above.

PRACTICAL

43



43

M 2



ELEVATION of a Cube in Perspective.

HA VING made the Plan according to the preceding Rules, and having put the Line of Elevation upon the Base Line, on some Side of the Plan, as *FL*, upon the same Line set off the Height of the Cube, *viz.* *FM*, and from the Points *F* and *M* draw Lines to the Point of Elevation *E*; then from the several Angles of the Plan *ABCD*, draw Parallels to the Base Line, till they meet with the Line *FE*, and from the Points of Intersection *F* and *H*, erect Perpendiculars *FM* and *HK*; then taking those Measures in your Compasses, set them perpendicularly upon the Angles; thus, taking the Height *FM*, set it on the two Perpendiculars raised from *A* and *B*, which will give you *AG* and *BG*; then taking the Height *HK*, set it on Perpendiculars raised from *C* and *D*, which will give you *CO*, *DO*; lastly, joining the right Lines *GO*, *OG*, the Cube will be raised.

For the Elevation of any Figure whatever always draw Lines from the several Angles of its Plan, parallel to the Base Line, till they cut the Line drawn from the Foot of the Line of Elevation, and proceed in all respects as directed for the Cube, and you will find there is nothing, however difficult and unequal, but will be thus brought into its Perspective. Examples of which we shall give in the Polygons following.

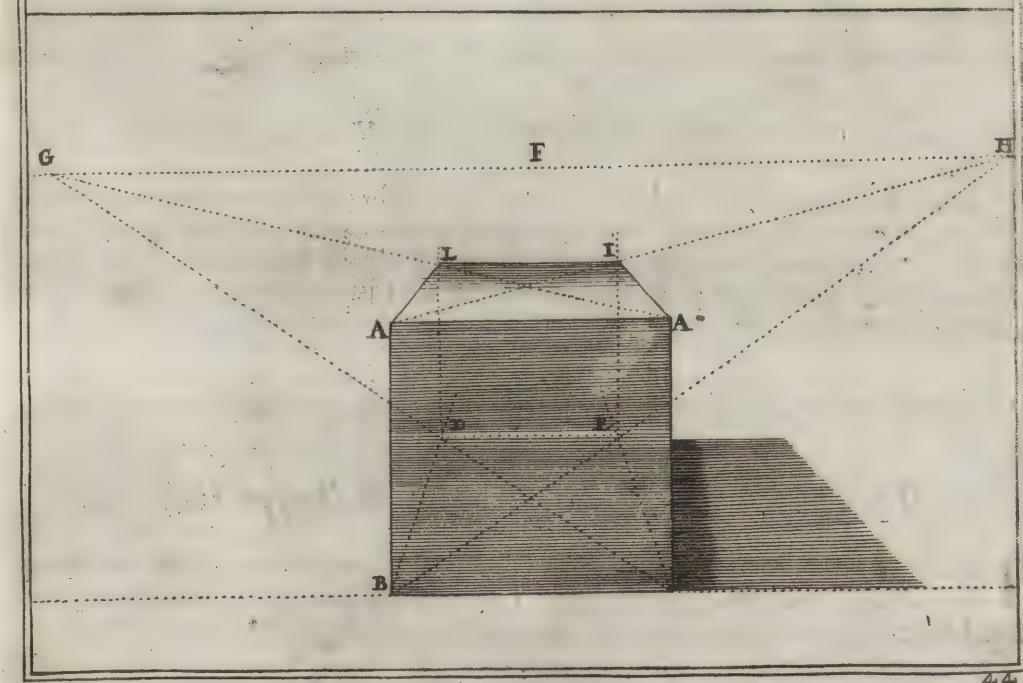
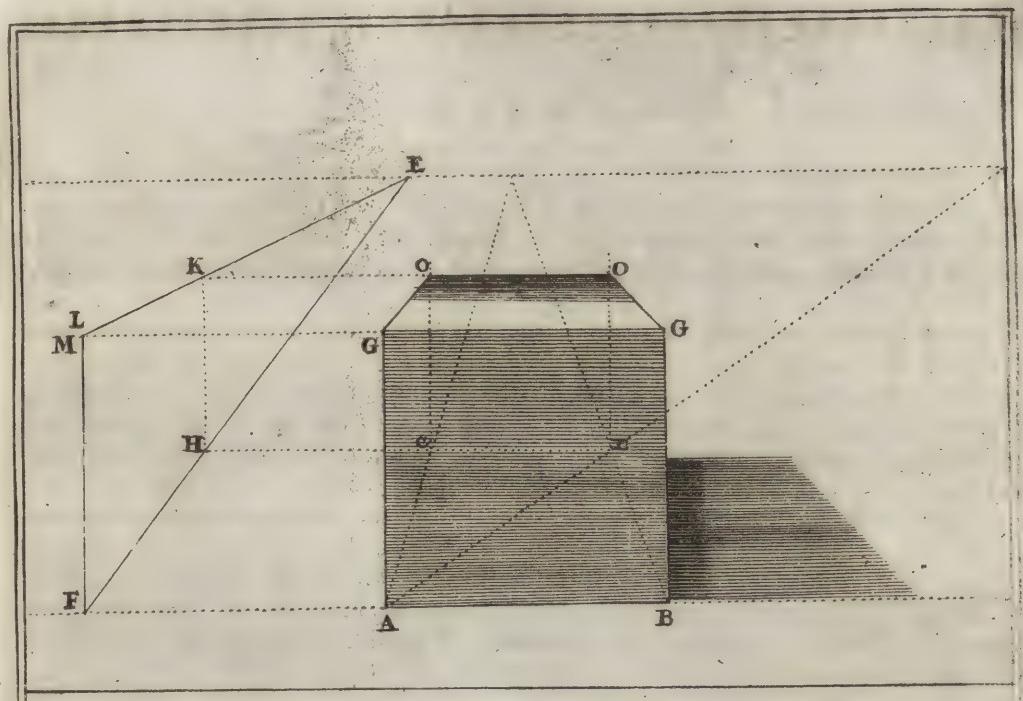
The second Figure is another Cube, raised after a somewhat different Manner from the first. The Process we shall describe in few Words, being nothing contemptible.

Having dispatched the Plan the ordinary Way, from the several Angles thereof, *BCDE*, erect Perpendiculars; and on the first of them, *BC*, set off the given Height of the Cube, *viz.* *BA*, *CA*; then from the Points *AA* draw Lines to the Point of Sight *F*, or to the Points of Distance *GH*, and the Points *I* and *L*, wherein they intersect the Perpendiculars of the Angles *D* and *E*, will give the Line of Depth, and the Top of the Cube perfectly raised.

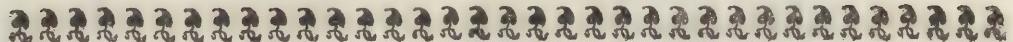
This latter Method is much less universal than the former, which has always been in use among the oldest Authors; yet has it some Advantages, which we may have Occasion to touch upon hereafter.

PRACTICAL.

44



44



Elevation of a TRIANGLE.

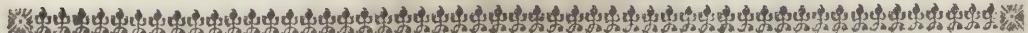
UNDER our last Article we promised to shew with how much Ease all Kinds of Figures may be raised in Perspective. Now of these, Polygons, or Figures of many Sides, are the most difficult: We shall therefore choose to exemplify in these; and, to observe some Order, will begin with the most simple, the TRIANGLE.

Having formed the Plan, as already directed under A R T. 21, where we have shewn the Method of drawing it with a Ledge or List: The Line of Elevation, as just now intimated, must be set on one Side, and of any Height at Pleasure, ex. gr. BA, which we'll suppose to be 3 Foot: Then from all the Angles of the Plan drawing parallel Lines, parallel to the Base Line, to the Line BE, and from the Points of Intersection erecting Perpendiculars between the Lines AE and BE, set off all their Heights upon the several Angles, whence the Parallels proceed: The Height AB, for Instance, on the Angles G and O, which will give GT and OV; the Height HL, on the Angle K, which will give KX; and the last Height NP, on the Angle Q, which gives QY. Lastly, connecting the Points R, S and Y, and again the Points T, V and X, by Right Lines, you will have the Triangle in its proper Thickness, &c.



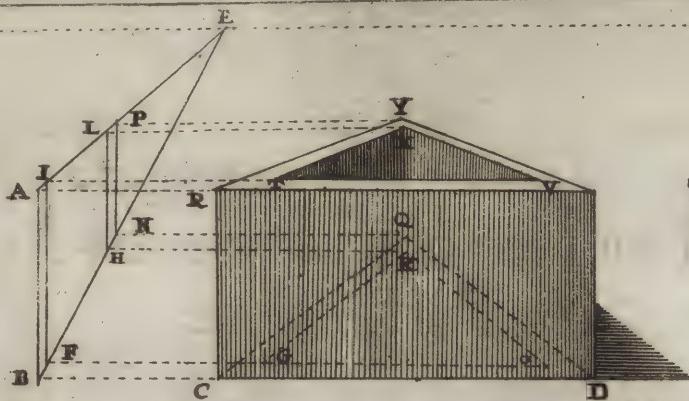
A PENTAGON, or Five-Angle, in Perspective.

THE PENTAGON, we have said, is a Figure with five Sides or Faces, and as many Angles; and have directed the Method of forming it in P. 22. As to the making its Elevation, we should lose Time to describe it, the Figure hereto annexed shewing abundantly that its Method is the same with that of the Cube and Triangle.

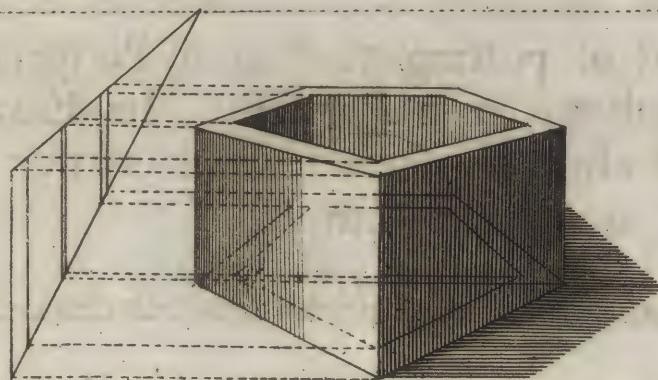


The HEXAGON, or Six-Angle, in Perspective.

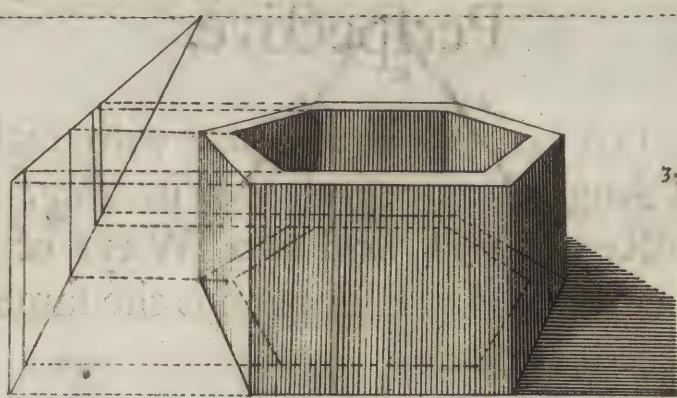
THE HEXAGON is a Figure with six Angles, and as many Sides or Faces, as already observed, P. 23 and 27. where we have given its Diminution. The Method of raising it is obvious enough from the Figure.



1.fig



2.fig

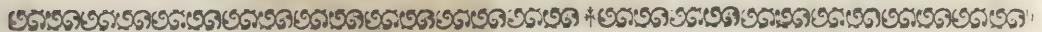


3.fig



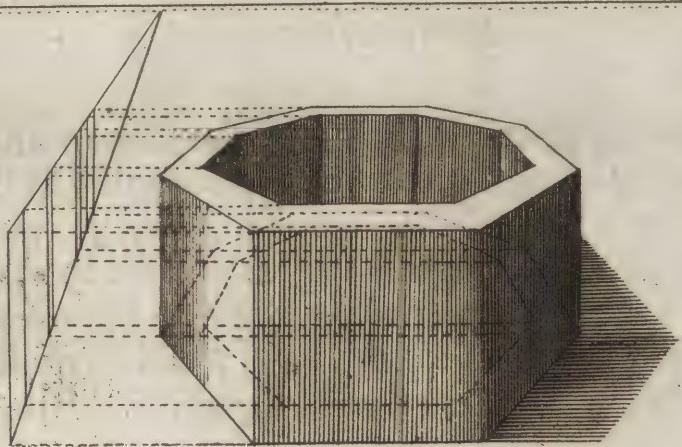
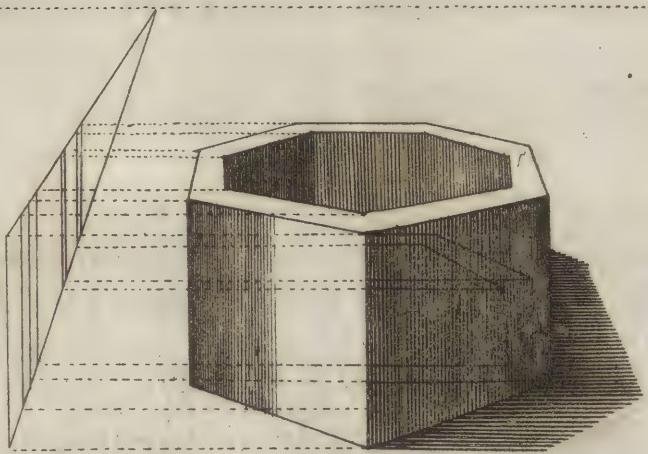
The HEPTAGON, or Seven-Angle, in Perspective.

THE HEPTAGON is a Figure with seven Sides and Angles ; the manner of describing it, and of putting its Plan in Perspective, we have already given in *Page 24.* Its Elevation is performed after the same manner as that of the Triangle, as appears from *Fig. I.*



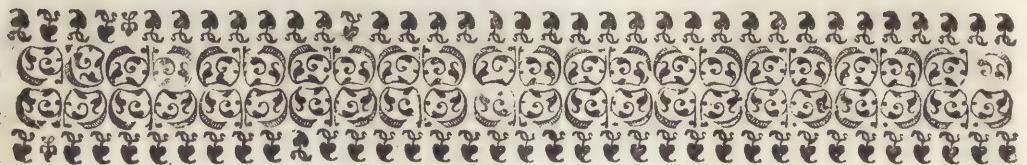
The OCTOGON, or Eight-Angle, in Perspective.

THE OCTOGON is a Figure with eight Sides and Angles, as represented in *Pag. 25, 26.* where the Reader will find two Ways of putting it in Perspective. Its Elevation is the same as that of the preceding one.



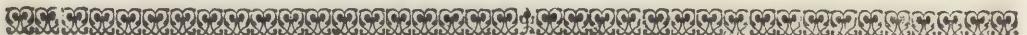
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N



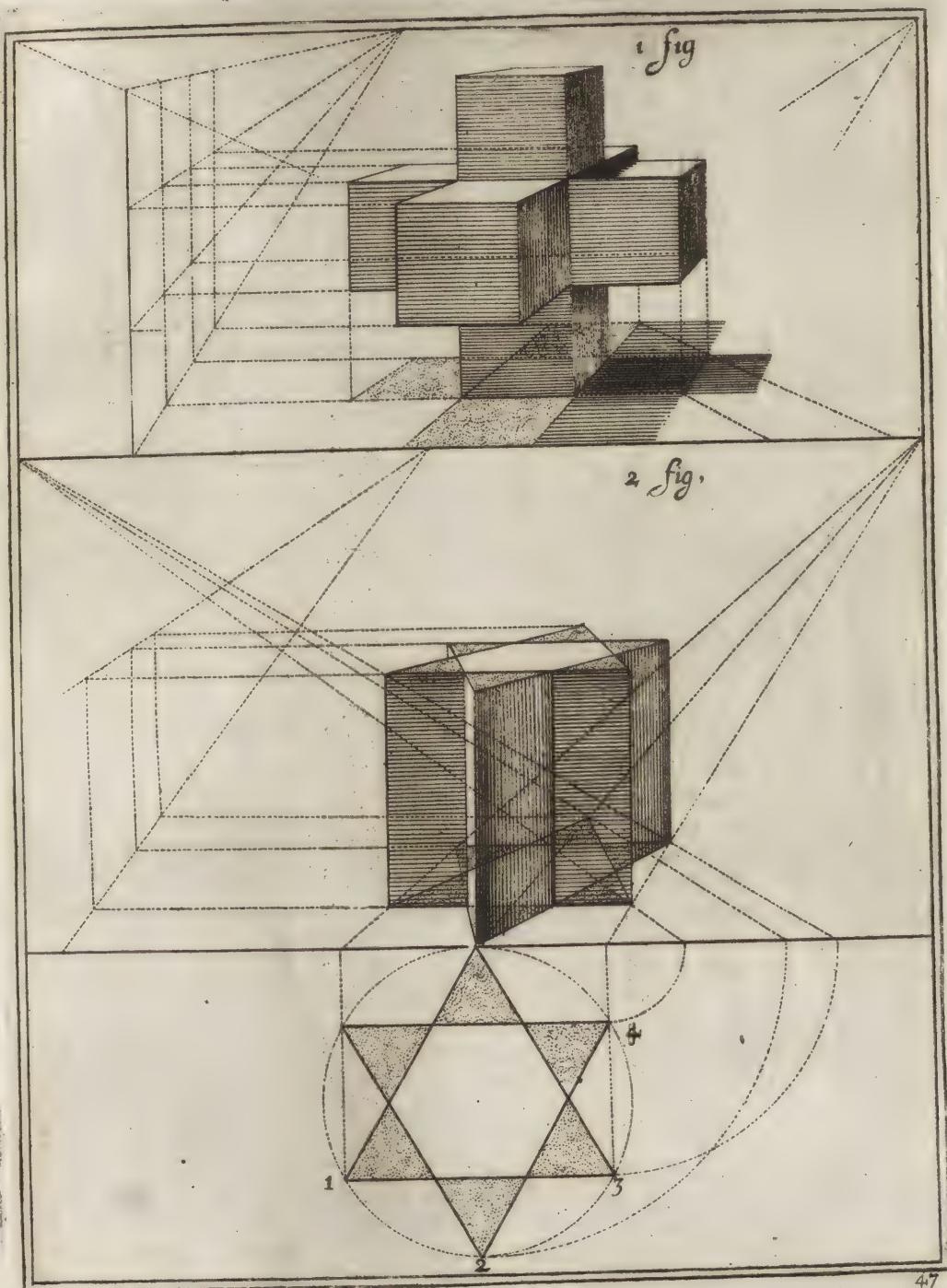
A Double Cross in Perspective.

THIS and the following Figure we add from the Sieur de Marolois, who has put them in his Works according to our Method. The Truth is, it were somewhat difficult to put them in Perspective any other way, by Reason of the Multiplicity of Angles; but in this Method all is easy, by only raising the Heights from all the Angles of the Plan, &c. as already observ'd of Polygons, and is evident from the Figure.



A Stone fluted, or channell'd star-wise, in Perspective.

NO T having given the Plan of this Figure among the other Plans, we have judged proper to add it underneath. The geometrical Plan is easily made, as being only a Circle divided into six, and the Divisions joined by right Lines, leaving a Point between each two; as, ex. gr. between 1 and 3, leaving 2; and from 2 to 4, leaving 3; and so of the other. The rest is obvious from the second Figure.



Of PILASTERS in Perspective.

IN the raising of Columns, Pilasters, Walls, or the like Objects, which are to be of the same Height, there is no need of a Line of Elevation; 'tis sufficient to proceed as in the second Method for the Cube, that is, having raised Perpendiculars from the Angles of the Plan, as here from A B C D of Fig. 1. set the Height desired on the first or second Perpendicular, as A F or D E; then drawing a Line from E to the Point of Sight F, to this Line all the Perpendiculars from the other Angles are to be raised: In which Case, the Pilasters G and H will be equal to the first.

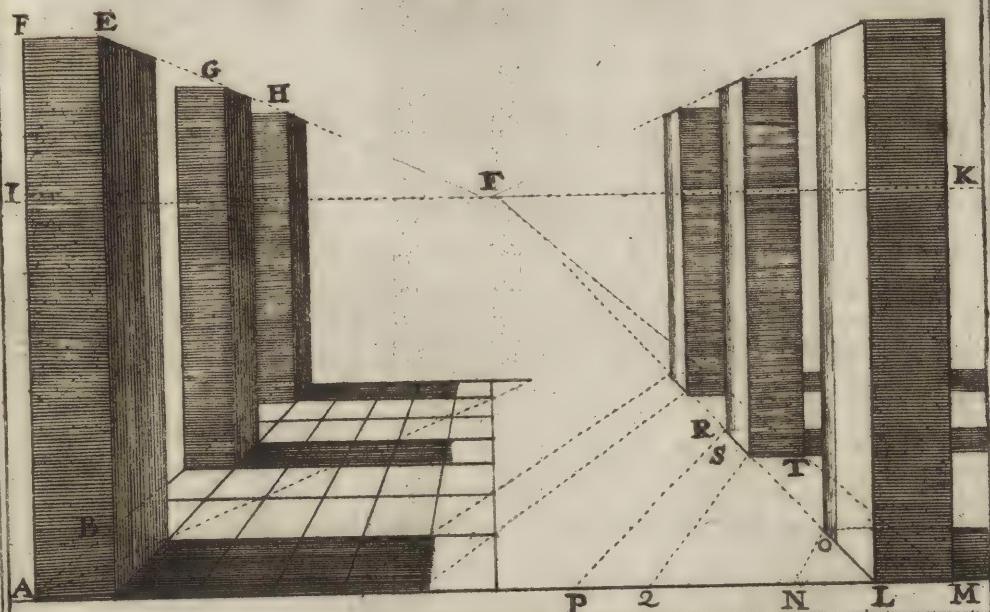
If one choose not to make use of Squares in the Plan, the Measures must be laid on the Base Line, and Rays be drawn thence to the Point of Sight F, and other Rays for the Diminutions to the Point of Distance K: Thus, ex. gr. L M being a Side of a Pilaster, Rays are to be drawn from the two Points thereof, L and M, to the Point of Sight F, for the Breadths of all the Pilasters; and for the Depth of each, as they are intended to be square, the Distance L M is to be taken and set off from L to N; then drawing a Line to K, it will give the Depth of the Pilaster in O; lastly, from the Points L M O erect Perpendiculars, and proceed as above directed. If you would have the Width of two Pilasters between one and another, set them accordingly on the Base Line, and after making the Depth of the second Pilaster equal to the first, as here P Q, from the two Points P Q draw Lines to the Point of Distance K, which will give the Points R S on the Ray L; and from S draw another little Parallel cutting the Ray M F, as the Line S T; lastly, from the three Points R, S and T erecting Perpendiculars; proceed as in the former Case. A third, fourth, &c. are to be added after the same Manner, still observing the same Measures on the Base Line as in the first Figure.

Of PILASTERS viewed by the Angle.

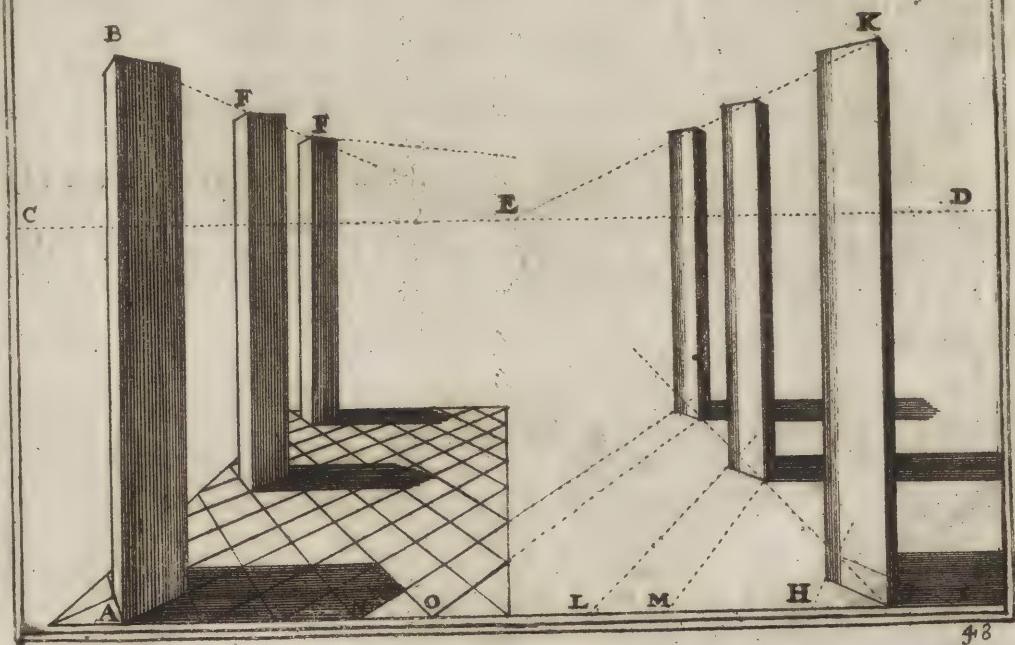
WE have already observed, that the Plan of Squares is formed by drawing Lines from the Divisions of the Base Line to the Point of Distance. As to the Elevations, the Method is the same with that just described: For having set the Height A B on the first Perpendicular, Lines must be drawn from the Point B to the Points of Distance C D, which will intersect and give the Heights of the other Perpendiculars raised on each Side; then giving the Distances required between the two Pilasters, which are two Squares, raise the second; and by the same Rule the third. Their Heights will be found by drawing a visual Ray from the Point B to the Point of Sight E, the Intersections whereof with the first Perpendiculars in the Points F and F, as also the Intersections of other Lines from F and F to the Points of Distance C and D with the other Perpendiculars, will give the Heights required, as in the first Pilaster.

Those done without Plans must have their Measures on the Base Line, as if they were to have the same Breadth with those viewed in Front. Accordingly, the Breadth G H must be marked, and a Ray be drawn from G to the Point of Sight E, which will give all the middle Points, or Diameters. Then setting the same Breadth from G to I, from the three Points G H I draw Lines to the Points of Distance C D, which form the first Plan. On this Plan erect Perpendiculars, on the first whereof set off the Height, as G K, and from the Point K draw Lines to the Points of Distance, which will give the Shortnings of the Perpendiculars of each Side. For the second Pilaster, do the same with the Points L and M: And for the third, with the Points N O. The rest is evident from the Figure.

1st fig



2nd fig





Effect of the Difference of HORIZONS.

THE higher a Man is raised above an Object, the more he sees of the upper Part thereof; of Consequence, the lower he is, the less he sees; and if he be underneath it, he only sees the bottom Part, and nothing of the Top.

The first Proposition is evident from Fig. I. the second from Fig. II. and the third from the last.

The first and second Cubes are formed after the manner already delivered. The third is also done by the same Rules, tho' they may appear somewhat more difficult, by Reason the Object is seen over-head; but, inverting the Paper, or Painting, and drawing Lines to the Point of Sight A, and Points of Distance B and C, as in the former Methods you will have the same Facility. We say nothing of Objects viewed side-wise, as having already so often repeated, that the Method is the same as of those in Front. To render the Practice of putting them in Perspective more easy, we have added two Figures, the one a bare Out-line, the other shadowed farther.

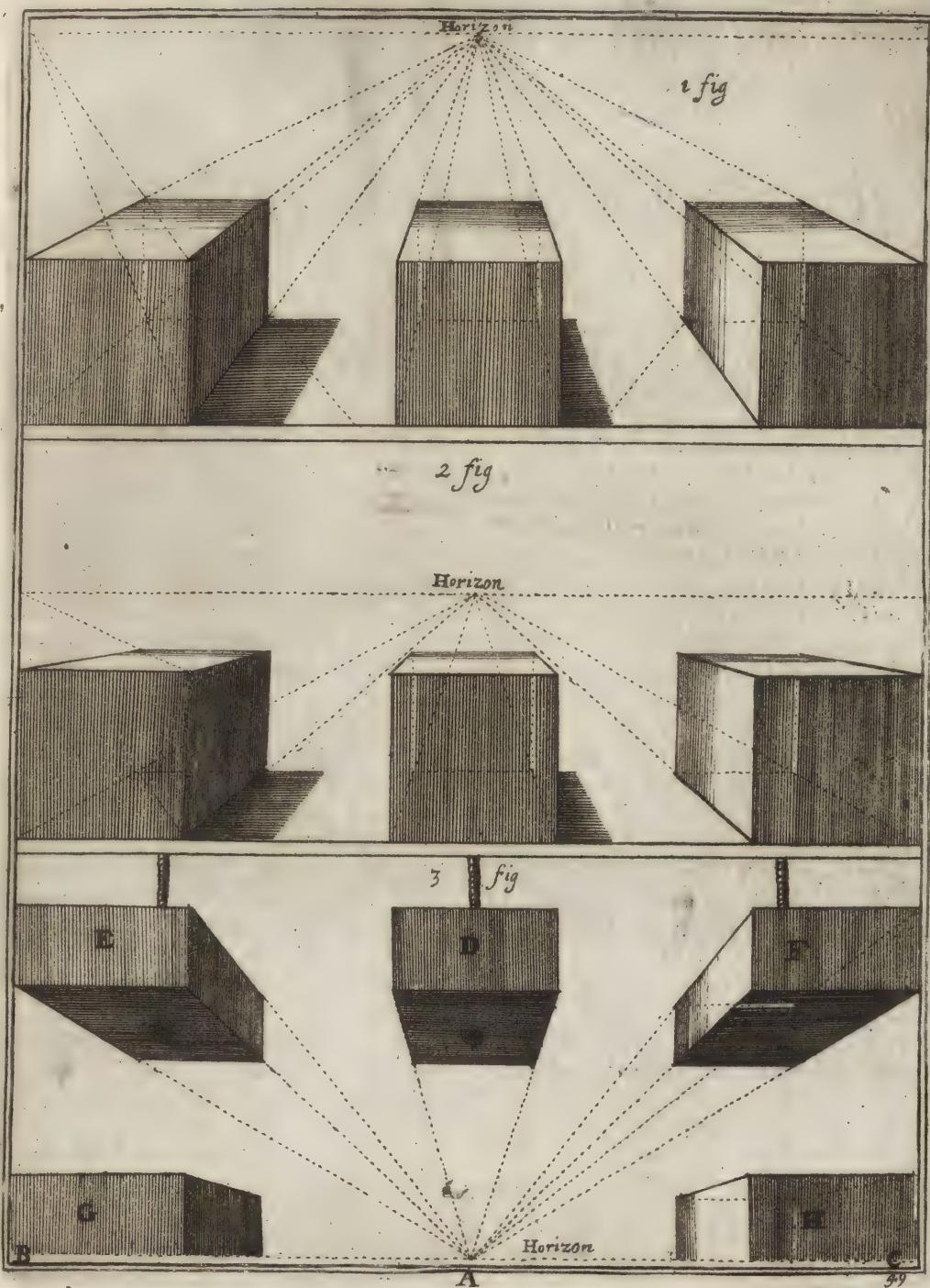
Before we quit this third Figure, it is to be observed, that the Lowness of the Horizon is the Reason we see the Bottoms of Objects, as DEF, whereas of the two others, GH, placed in the Horizon, neither Top nor Bottom can be seen: Not the Top, by Reason of the Lowness of the Horizon; nor the Bottom, because they are the Horizon itself.

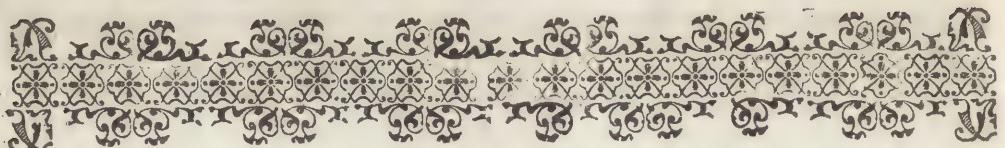
There are Abundance of Painters faulty in this Point, making no Scruple to shew the Tops of Objects, even where the Horizon is very low. 3



PRACTICAL.

49





Elevation of Objects view'd by the Angle.

WE have already shewn in p. 19, 20. how the Plans are to be form'd, the Lines being always to be drawn to the Point of Distance, not to the Point of Sight, unless for finding the Diameter. The same Rule is to be observed for the Elevations, as is evident from the first Figures, all the Lines whereof are drawn towards the Points of Distance B and C, and none of them to that of Sight A.

The first Figure D shews that tho' there be an infinite Number of Parts in any Object seen Angle-wise, they are all to be drawn to the Points of Distance B and C. If you would do one after the same manner, the Rule is this; having formed a Plan, and raised occult Perpendiculars, as already directed, set the given Height on the first Angle, as E F, and from F draw Lines to the Points B C, for the Heights of the second and third Angles, in the Points G; then from G draw Lines to B and C, and you will have the fourth Angle of the Platform. The other lesser Pieces are raised after the same manner, viz. by setting the Heights on the first Perpendicular, as from F to H; and from H drawing Lines to the Points C and B, as before done from the Point F: By such Means you will have the Heights of all the Angles, and the Points I and K will give the Thickneses of all the lesser Pieces, and the Platform of the Middle, by still continuing to draw Lines to the Points B and C. The rest is evident from the Figure, which may serve for a Castle defended with four square Towers, or for a Palace cantoned with four Pavilions.

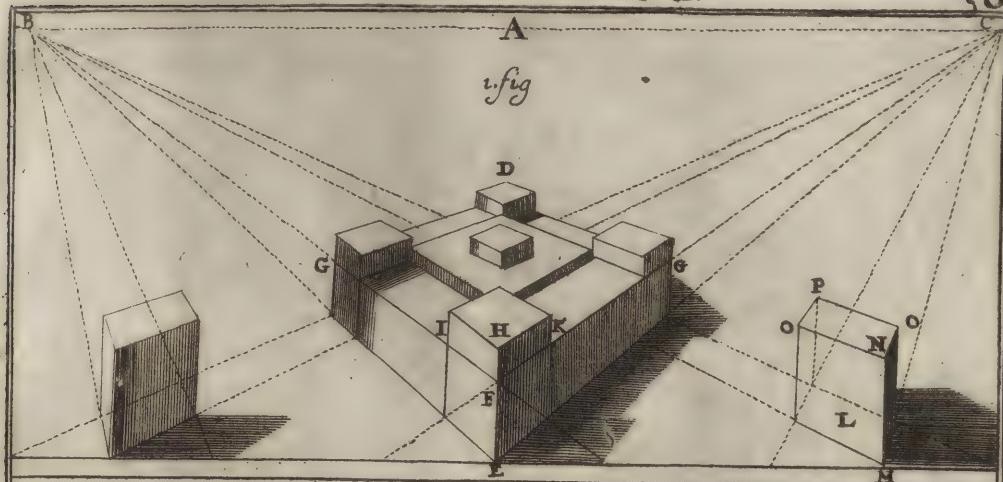
The two other Objects on each Side the great one are seen Side-wise; the manner of drawing them is in all respects like those viewed in Front: Thus, raising Perpendiculars from all the Angles of the Plan L, and giving the necessary Height to the first of them, as M N, and drawing a Line from the Point N to the Points of Distance B C, you will have the second and third Angles in the Points O O; then drawing Lines from O to the Points B C, you will have the fourth Angle, which is the Elevation of the whole. This is according to the first Method; the second would have given the same.

The second Figure underneath is done the same Way; all the Difference is, that in this the Horizon is somewhat lower.

The third shews the Bottom of the Objects; but the Method is still the same as in those that shew the Tops, the Lines being drawn to the Points of Distance Q R in the horizontal Line.

PRACTICAL

50



2.fig.

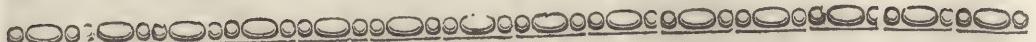


3.fig.

Horizon.

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O



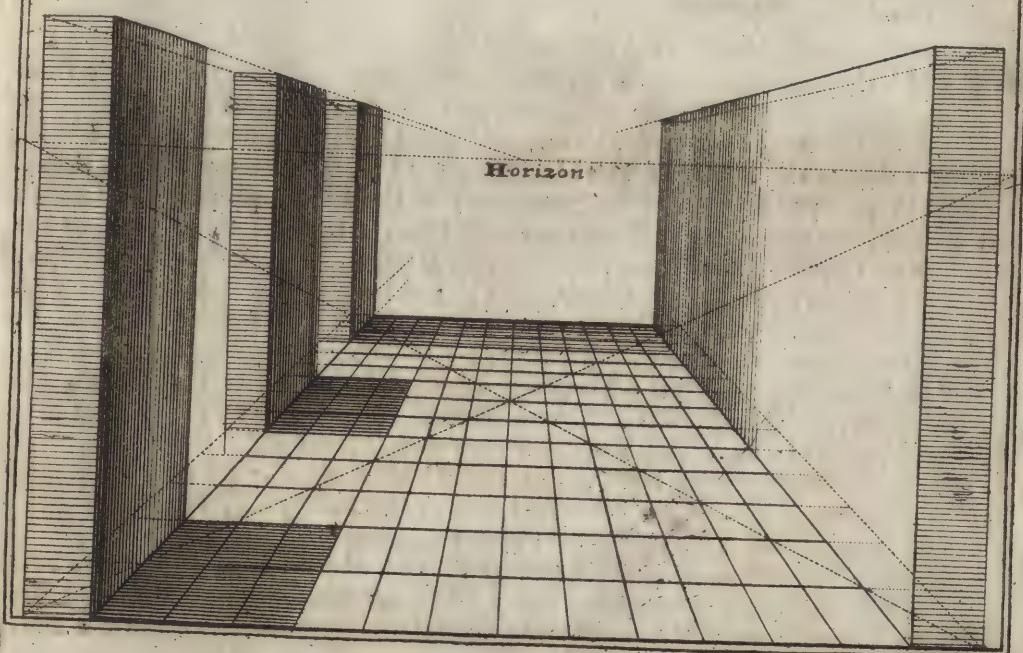
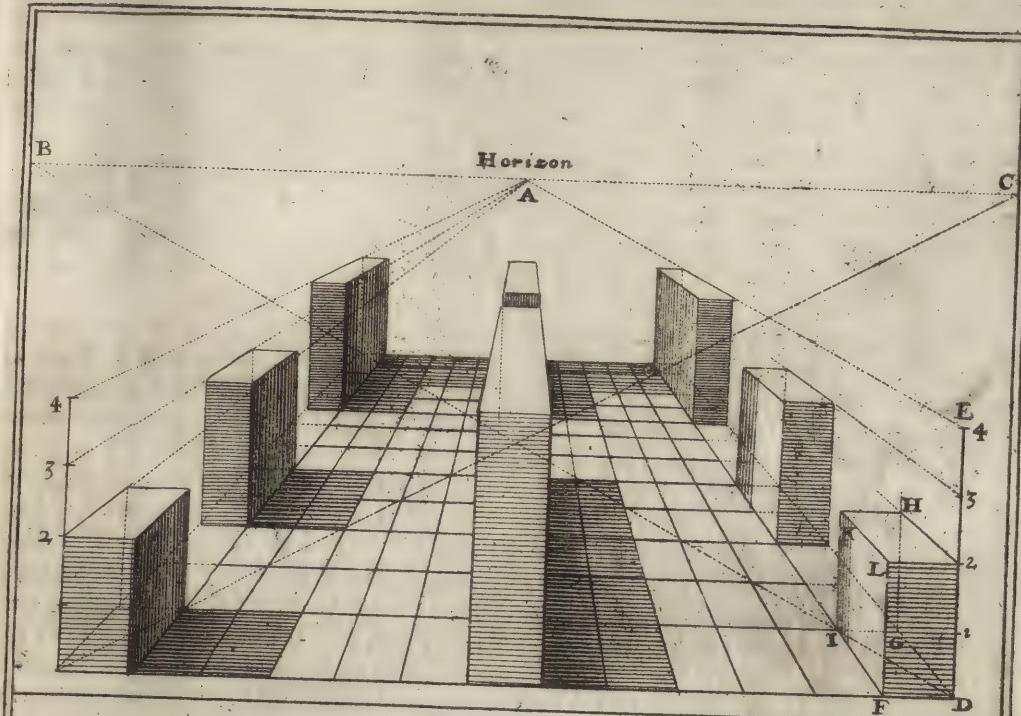
To raise Objects of any Heights, and remove them to any Distance at Pleasure.

SUPPOSE it required to have an Object two Foot high, one Foot broad, and one Foot deep; and another three Foot high, one Foot broad, two Foot deep, and two Foot distant from the first Object; and another a Foot broad, five Foot deep, four Foot high, and three Foot distant from the middle Object; your Method of proceeding will be thus: Having formed a Plan of Squares, supposed each equivalent to one Foot, by Means of the Points of Sight A, and Distance BC; from the first Angle erect a Perpendicular according to the second Method above directed, which Perpendicular is to carry the proper Measures to all the Objects, as here DE, wherein the Measure DF is set four Times, by Reason the highest Object is not to exceed four Foot. From the several Angles of the first Square FIGD erect occult Perpendiculars; and having set the proper Measure, *viz.* two Foot, on the first of them, D', from the Point 2 draw a Line to the Point of Sight A, and it will cut the Perpendicular of the Angle G in the Point H, through which a Line is to be drawn parallel to the Base, cutting the Perpendicular of the Angle I in K, and another Parallel to be drawn through the Point 2, cutting the Perpendicular of the Angle F in the Point L; then connecting the four Points HKL and 2, by right Lines, you will have the first Object. Now as you would have a Space of two Foot between the first and second Object, two Squares are to be left vacant between them; and on the first Angles of the third, Perpendiculars are to be raised, and the same done as to the first Object, with this Difference, that the Height of the second is to be taken from the third Point of the Line DE, by Reason it is to be three Foot distant, and that it is to take up two Squares, since it is to be two Foot deep. Between this second and the third Object the Space of three Squares is to be left, by Reason there are to be three Foot from the one to the other. From the first Angles of the fourth Square Perpendiculars are to be raised as for the first Object, and five Squares farther, another Perpendicular for the Line of the Depth, and the Bound of the five Foot, which is the Depth of this third Object. The fourth Point of the Line DE gives its Height, four Foot, by cutting the Perpendiculars, as in the first Object. The Objects on the other Side are raised in the same Manner, and on the same Proportions as these; but the Wall in the Middle is of an equal Height every where, *viz.* four Foot, with an Aperture of three Foot in the Middle.

In the second Figure are three Walls of equal Height; whereof that in the Middle is a Square deeper than the two extreme ones. Between each is an Aperture of three Foot, for Doors or Windows. On the other Side is a continued Wall fourteen Foot long, and of an Height answerable to the rest. The Method of elevating all these, is the same with those above. What we call a Wall may likewise serve for a Hedge, Pallisade, &c. of a Garden.

PRACTICAL.

51



O 2

51

PERSPECTIVE

Of WALLS viewed in Front.

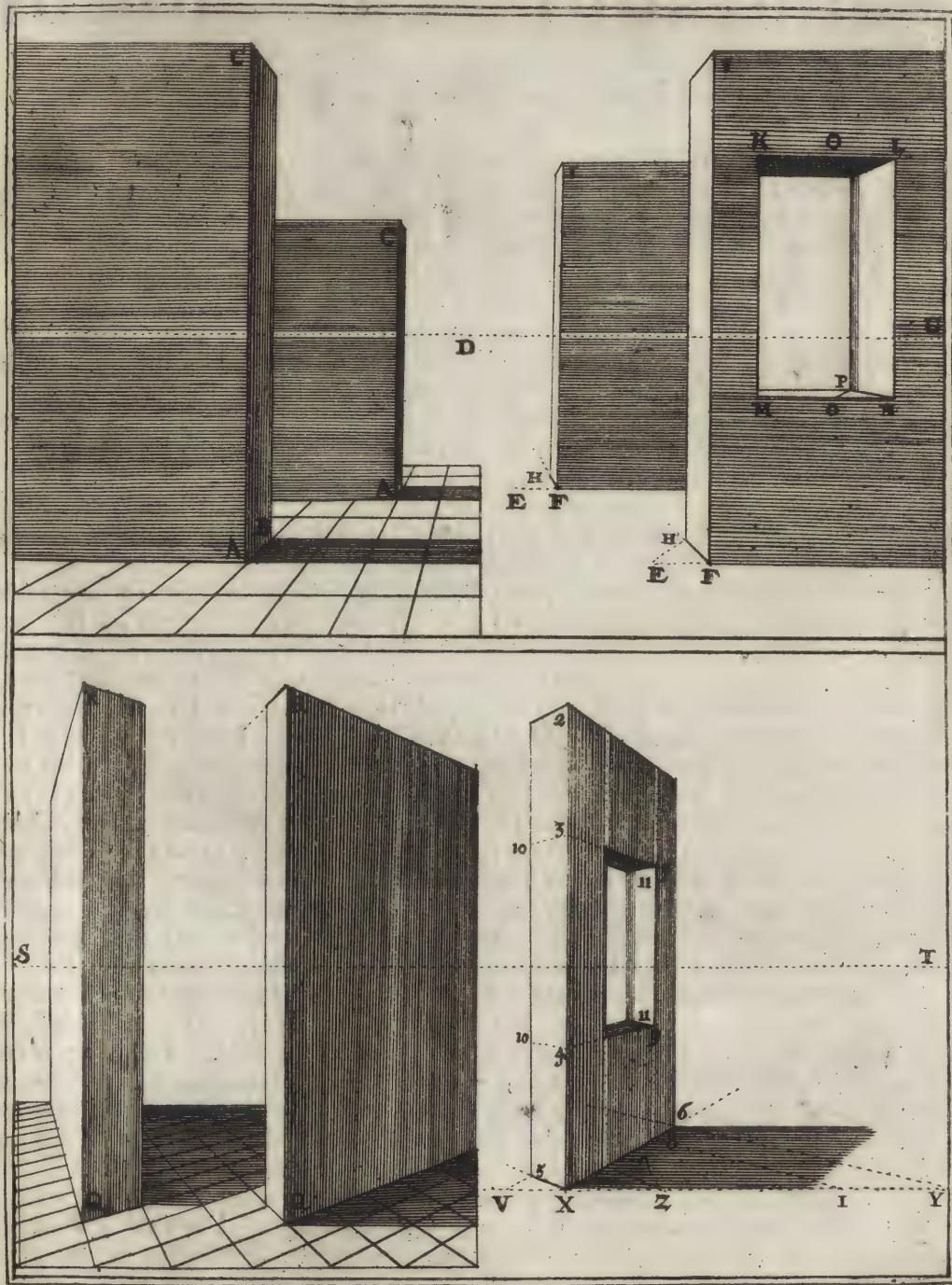
FR OM what has already been said one may raise Walls of all Kinds in any oblique Views; and tho' the same Method may serve for the same Walls viewed in Front, we have thought proper to add this Figure on two Accounts: 1st, By Reason it is not always that Plans are made, and on such Occasion a Man would be a little to seek for the Thicknesses. 2dly, To give the Thicknesses to Gates and Windows, which might occur in such Walls.

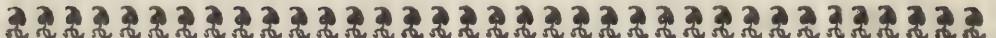
To make Walls parallel to the Base Line, or the Horizon, on a Plan, one may give them any Length at Pleasure on the Parallels to the Horizon. For their Breadth, you may take that of a Square, from the Angles whereof A B, you are to erect Perpendiculars to any given Height, as C; from C draw a Ray to the Point of Sight D, and CD will give the Diminution of the Wall.

When there is no Plan, the Thickness of the Wall, as E F, is to be set on a Parallel to the Base Line in the first Corner of the Wall; then from F a Line is to be drawn to the Point of Sight D, and from E, another to the Point of Distance G; and from the Intersection of the two in the Point H, a Perpendicular to be raised, and another from the Point F: Then the Height of the Wall FI is to be taken, and from I a Line to be drawn to the Point of Sight D, the Intersection whereof with the Perpendicular H, will give the Diminution of the Wall. For the Length, you may give it at Pleasure on the first Parallel E F. For the Doors and Windows in the same Walls, mark the Width and Height as here K L M N, and set the Thickness required on a Parallel, either above or below the Doors or Windows, in the Corner next the Point of Distance, as here N O or L O; lastly, from the Points L and N draw Lines to the Point of Sight D, and from the Points O to the Point of Distance G, and from the Intersections of those Lines in P, &c. draw the Thicknesse.

Another WALL viewed by the Angle.

HA VING the Plan, you have nothing to do but erect Perpendiculars from the Angles already determined, and to mark the Heights on the Perpendicular from the Angle next you, as on the Line Q R; and from the Point R, to draw Lines to the Points of Distance S T; the Intersections those Lines make, with the Perpendiculars raised from the Angles of the Plan, will give the Length and Thickness of the Wall. If you have no Plan, set the Measures both of the Breadth and Depth of Doors and Windows on the Base Line, as in this Example, V X is the Breadth, X Y the Depth, and Z 1 the Height of a Window; then from all these Points draw Lines to the Points of Distance S T; first from X, which is the Ray of the Base; then from V, a little occult Line cutting the Ray X S in the Point 5, which is the Thickness of the Wall. As to the Depth, the Ray Y S will give it by its intersecting with X T in the Point 6; and Z 1 will give the Breadth of the Window in the Points 7, 8; from which Points X, 5, 6, 7, 8, Perpendiculars being raised, and the Height 2 being set on the first of them X, and from the Point 2 drawing Lines to the Points S T, the Intersections with the Perpendiculars will give the Height of them all. From the Height of the Window, marked 3, 4, draw Lines to T, and where these intersect the Perpendiculars 7, 8, Lines are to be drawn; and from the Corners 9 to S, for the Depth 10, draw Lines to T; and from the Point of Intersection 11, draw a Perpendicular. This now may serve for a Pallisade as well as a Wall.





To place a Door in any Part of a Wall at Pleasure.

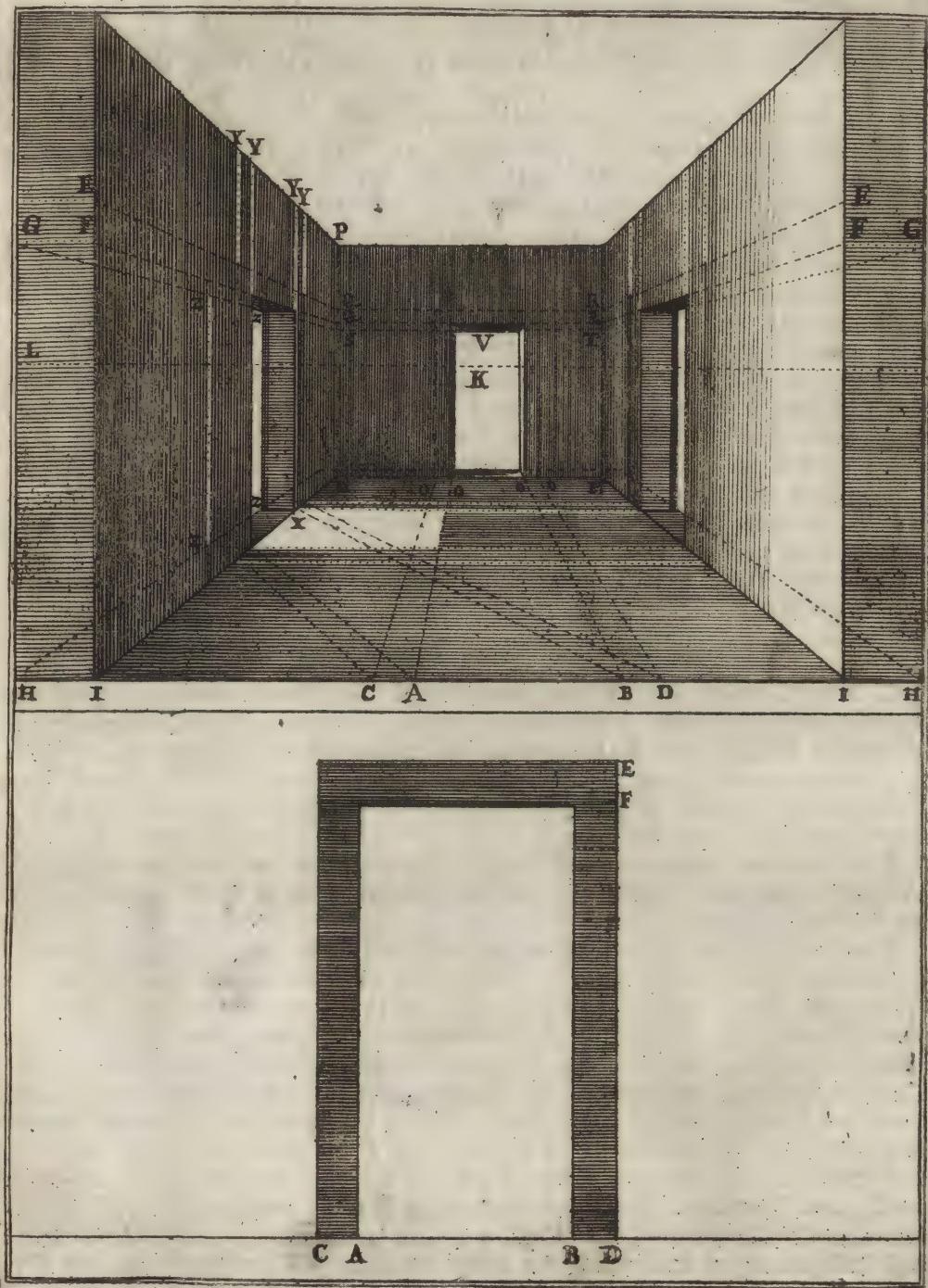
A Wall is to be raised one, two, or three Foot thick, on the Points H I, and to be carried on of the same Height, as already directed. If then you know pretty nearly the Dimensions of the Door, set the Breadth on the Base Line, as here in AB of the lower Plan, containing three Foot, and a Side of A and B set the Breadth of a Frame, or Band, D and C, and from ABC and D draw Lines to the Point of Sight K ; and where they cut the Parallel MN in the Points O O, &c. erect Perpendiculars of any Heights at Pleasure : Thus is the Width of the Door already got. For its Height, D F E is to be transferred from the Plan underneath to the Corner of the Wall I, and Lines to be drawn from the Points F E to K ; and where they intersect the Perpendicular M P in the Point Q, draw Q R parallel to M N, which will give the Height of the Door, and the Band or Frame a-top. Its Thickness, or Depth, will be the same with that of the Wall, which is G F. And if from G you draw a Line from the Point of Sight K, it will cut the Perpendicular M P in the Point S, through which drawing S T parallel to Q R, you will have the Thickness of the Door V.

To make a Door in a Side-wall, the Instructions given in Pag. 17. are to be well remembered; importing, that all the Measures are to be put on the Base Line ; and, that Lines being drawn from these Measures to the Point of Distance, will give all the Diminutions desired. For an Example, a Door four Foot broad is desired in a Chamber. Set off four equal Distances from I to C, and draw Lines from the Dimensions of the Door C A and B D to the Point of Distance L ; where the Ray I M intersects those Lines, erect Perpendiculars X Y, which will give the Breadth of the Door. For its Height, draw Lines from the Points E and F to the Point of Sight K, and the Intersections with the Perpendiculars will give the Height. As to the Thickness of the Top and Bottom, draw the Thickness of the Wall, G H and F I, to the Point of Sight K ; then drawing a little Parallel to the terrestrial Line, through the lower Corner of the Door X, and another through the upper Corner, you will have X Z, the Thickness of the Top and Bottom, to be joined by a Perpendicular, as you see in the Figur.

If you would have a Door on the other Side, you have nothing o do but draw Parallels to the Base Line from the Point X to the Ray I N, and then raise them as already directed. The rest is the same as on the other Side. The Gate is not here represented in the Middle ; which is a Thing we did designedly, to obviate the Error of such as, without any other Measures, draw two Diagonals through their Painting, tho' of ever so great a Size, and make all their Objects equally distant from the Intersection of those Lines, i. e. from the Middl of the Painting : So that, on their Principle, a Body should always be mounted to shew their Work in all its Advantage ; which is a palpable Oversight. For ho' a Painting should be forty Foot high, and it should be placed on the Ground o be seen, the Horizon should never be above five Foot high, but rather less thanmore ; whereas in their Way the Horizon should be twenty Foot high.

PRACTICAL

53



53

To draw Windows in Perspective.

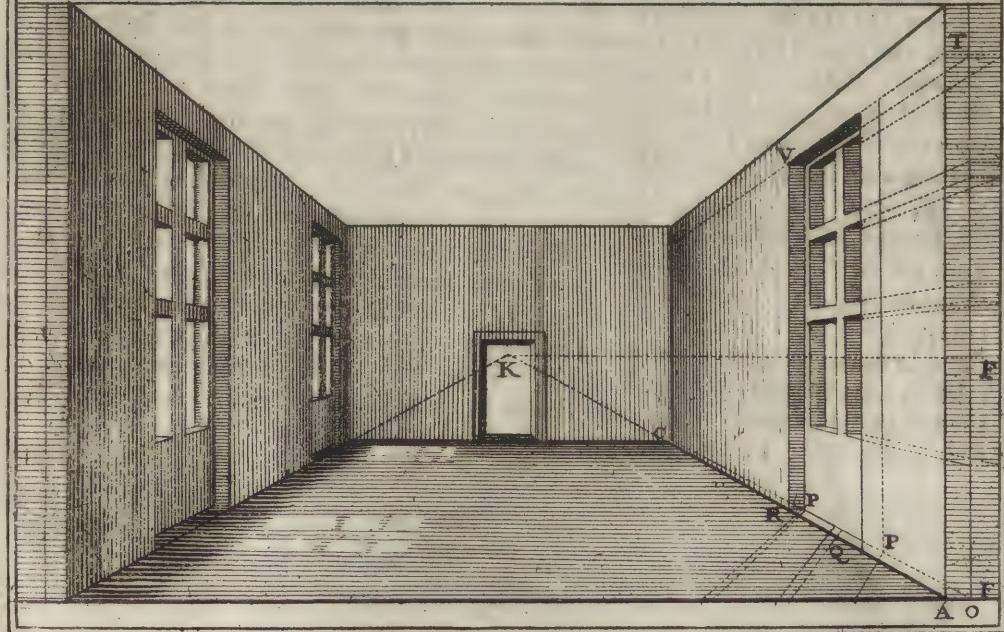
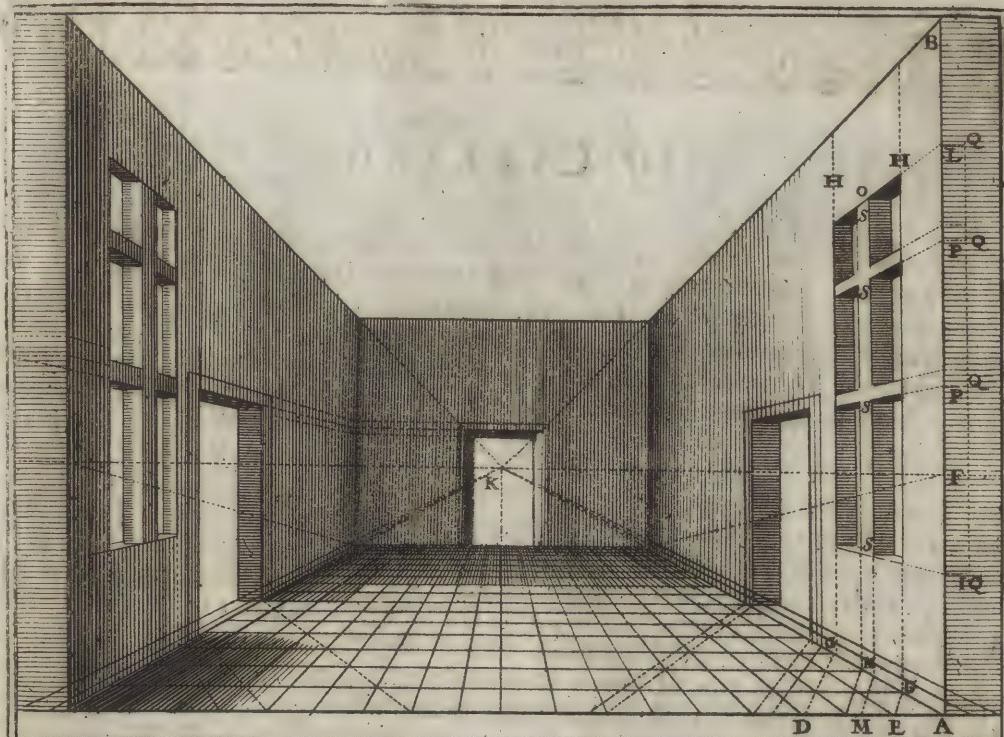
THE Method of describing a Window is perfectly the same with that of a Door ; for if there be any upright Post, or Wicket, in a Door, 'tis no longer a Door, but a Window : So that you have nothing to do but learn to make a single and double Cross, and you are Master of Windows. Suppose now 'twere required to make one in a Wall AB, of any Breadth at Pleasure, lay down its Breadth on the Base Line, as DE, and from the Points D and E draw Lines to the Point of Distance F, and from the Intersections GG, of those Lines with AC, erect Perpendiculars GH, GH giving the Width of the Window, which is here only two Squares, or Panes. As to the Height, it is usually raised as near the Cieling as may be, but the Breast-part should not be above three Foot and half ; this Measure therefore is to be set on the Perpendicular AB, as from A to I, and drawing a Line from I to K, where that Line intersects GH, will be the Breast-part. After the like manner drawing a Line from L, the Top of the Window, to the Point of Sight K, its Intersection with GH, will be the Top of the Window ; by which Means we shall have a long Square, or Parallelogram, to which a Cross being added, will form a Window. To make this Cross, the Space DE must be divided into two equal Parts, each being about half a Foot ; then drawing this Breadth M to the Point of Distance F, and from the Intersections thereof with the Ray AC, erect Perpendiculars NO for the upright Post, or Stancher, in the Middle of the Window. As to the Cross-pieces, you may add as many as you please, only observing that their Thickness must be equal to that of the upright Piece ; taking the Measure M therefore set it off upon the Perpendicular AB, as is P, and drawing a Line from P to K, the Points wherein it intersects the Perpendiculars GH, GH will give the cross Bars, and of Consequence the Window is finished. For its Thickness, 'tis here only to be half that of the Wall ; to accommodate which, occult Lines must be drawn from the Point Q to K, and little Parallels to the Base being drawn from the Corners of the Window S, the Point wherein they cut the Line QK will give the Thickness required.

This Window ranges even with the Wall on the Inside, which is not very usual, Windows being now frequently made with Embrasures, or Niches entering into the Wall a Foot, or less.

The Method is precisely the same in both, only that instead of taking the Intersections on the Line ACK, they must here be taken in another, re-entering into the Wall as much as the Window is made to re-enter, as appears from the lower Figure, where the Ray OK receives the Measures laid on the Base Line ; and that all the rest must be drawn to the Point of Distance F, as in the former Case, taking the Thickness of the Window between the Perpendicular O, and the other F, which is the last. Lastly, when the Window is finished, on the Ray OK, and from the Breadth of the Wall OF, raise the Perpendicular A, and draw it to the Point K ; then from the lower Corner of the Window, in the Points PP, draw a little Parallel cutting AK in Q, which will be the Thickness of the Wall, covering the Window a little, and shewing the Thickness RP ; then from the Point R erecting the Perpendiculars RV, cutting the Ray TK in V: which will be the Thickness of the Top of the Window. From the Measures here laid done, one may make as many as one pleases, still observing the same Order.

PRACTICAL.

54



P



Of CIELINGS.

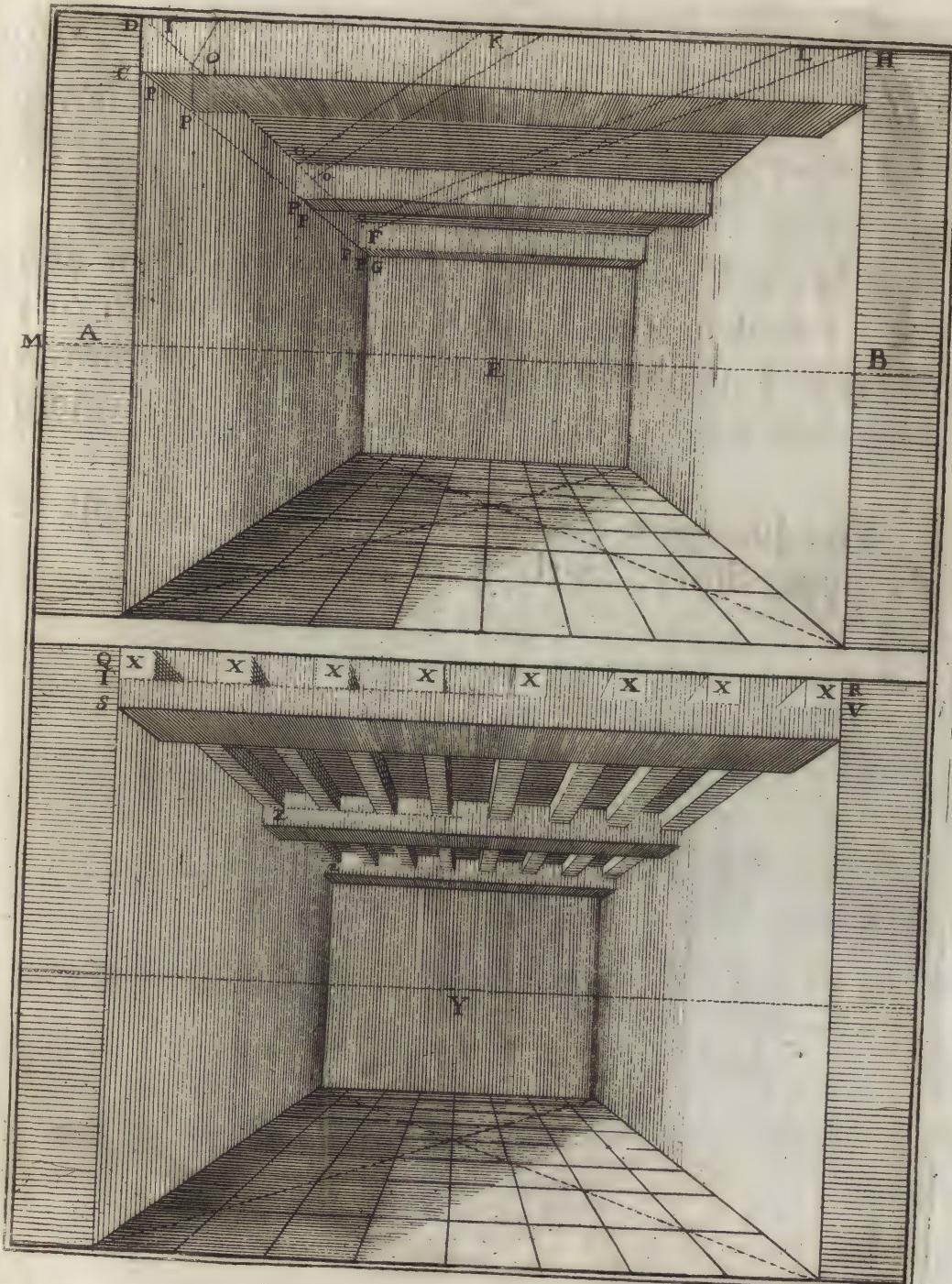
IN Perspective we ought in some Measure to follow the same Order that the Masons observe in raising a Building from the Ground: The Pavement, or Ground-work, is their Foundation, whereon they raise Walls, which they pierce in as many Places as they please for Doors and Windows.

Suppose the Walls raised A B, on which Beams are to be first laid, and over those, Joists or Quarters; having measured the Square of any Piece (which we here suppose a Foot) it is to be carried to the Top of the Wall, as C D, and from the Points C and D occult Lines to be drawn to the Point of Sight E, which will give the Rays C D G F. The same Measure C D is likewise to be set on a Parallel to the Horizon D H, whereon all the Measures of the Joists, &c. to be laid on the Wall, are to be disposed, as we have here done the three I, K and L; then drawing Lines from all these Measures to the Point of Distance M, and from the Intersections with the Line D F, in the Points O, O, &c. letting fall Perpendiculars, cutting the Rays C G in the Points P, P, &c. and lastly, drawing Parallels to the Horizon through the Points O and P, you will have the Beams, or Girders, orderly laid: As in the first Figure.

Now, to lay the Joists upon the Beams, or, more properly, to mortaise them there, the Line Q R is to serve as a Base Line whereon to lay the Joists in such Number, and at such Distance from each other, as shall be judged expedient; the Rule being usually to be twice their Thickness apart from each other. To mortaise them, take their Thickness within that of the Beam Q S, such as Q T, and draw an occult Line T V; then between Q R, and T V, range the Joints, X, X, &c. and from all their Angles that are visible, draw Lines to the Point of Sight Y. And that they may not exceed the half of the other Beams, from the Middle of the first, which is the Point T, draw an occult Line to the Point of Sight Y, which will cut all the other Beams in half, in the Point Z; lastly, from the Point Z draw Parallels to the Horizon, that you may not pass them in drawing Lines from the Joists to the Point of Sight. If you don't care to take so much Pains, set the Joists Z on the Line Q R, as they are underneath; then draw Lines boldly from one Beam to another, from all the Angles of X, X, &c. to the Point Y, and you will have what you require.

PRACTICAL.

55



55

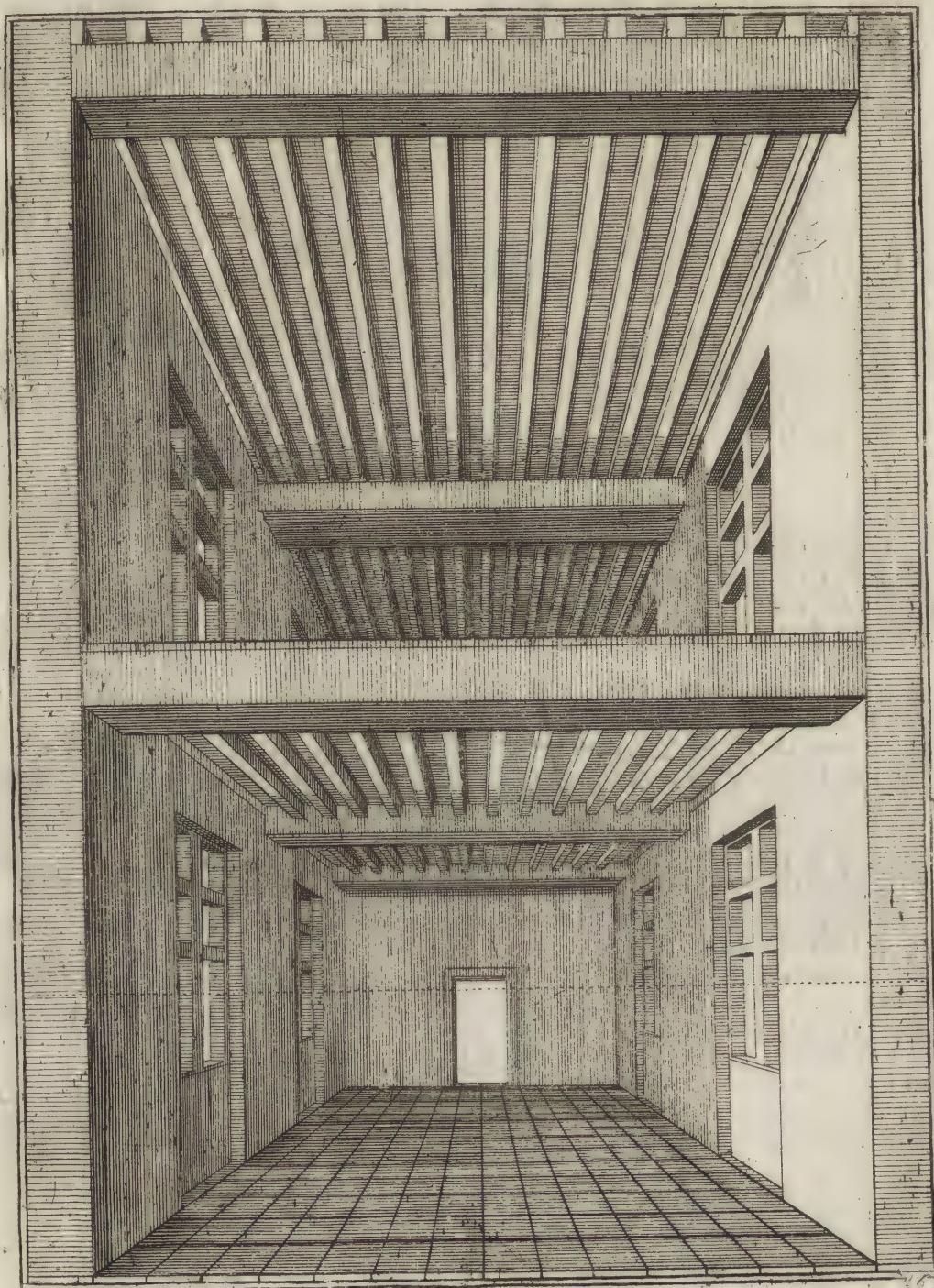
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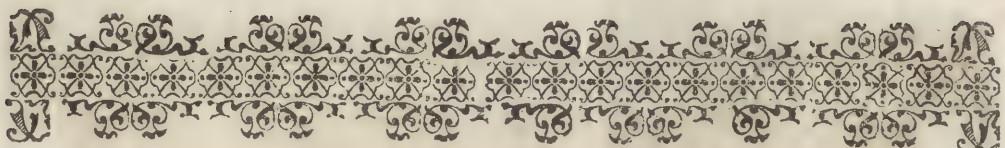


THIS FIGURE is only added to shew the Effect of the Method just now laid down ; wherein it is observable the Number of Stories does not render the Practice at all the more difficult.

The Joists are not mortais'd into the Beams of the upper Story, as they are in the lower.







Another Disposition of CEILINGS in Perspective.

THIS Method is performed in all Respects like that just described, only that the Disposition of the Members and Pieces that compose the Cieling i to be changed; that is, the Beams are laid long-ways, tending towards the Point of Sight, and the Joists a-cross, which is the reverse of the former.

Suppose the Walls A B; on these, or on Consoles jutting out from them, set the Thickness of the Beam C D, and through the Points C and D draw Parallels to the Horizon C E and D F, between which you may put any Number of Beams at Pleasure, as we have here done three, *viz.* G H and I, from all which Lines are to be drawn to the Point of Sight K; then through the Point P, wherein D P intersects the Perpendicular L P, draw a little Parallel to the Horizon P M, this will be the Bound of all the other Rays, as G N, &c. lastly, from the Point N erect a Perpendicular N O: And so of the rest. Thus much for the Beams.

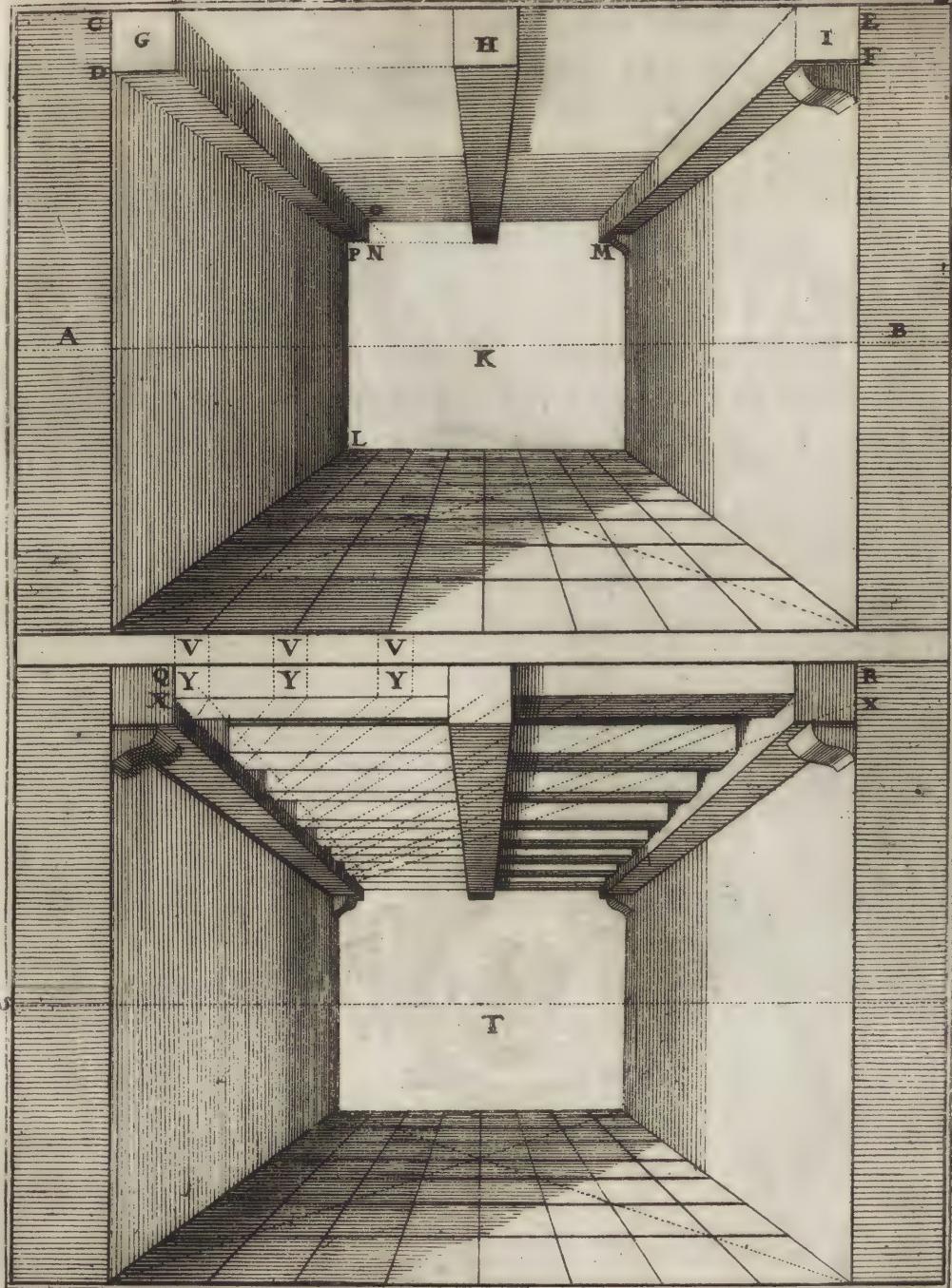
To lay the Joists a-cross the Beams, set their Thickness on the Line Q R, as V V V; and from the Extremes of V draw Lines to the Point of Distance S; and through the Points of Intersection with the Ray Q T draw Parallels to the Horizon, as far as the Beam of the other Side. If you would mortaise them in the Beams, take the Thickness of the Rafters within the Beam, as Q X; and from X draw a Parallel to the Base Line, as far as the other Side X X; and between the two Lines Q R and X X set the Divisions V V, &c. which will form Y Y, &c. And from all the Points Y drawing Lines to the Point of Distance S, you will have the Thicknesses of the Bottom and Sides given by the Intersections with the Ray X T in the Points Z Z, &c. through which drawing Parallels to the Horizon, the Ceilings will be finished; as in *Fig. II.*

Thus it is that simple Timber Ceilings are put in Perspective. If, after these, or in Lieu of these, you would have a handsom Platform of Painting, or other Enrichment, you will find Instructions for the same in *Page 35.* where we speak of Gardens: And making Use of the Line Q R for a Base Line, you may do what you please therein.

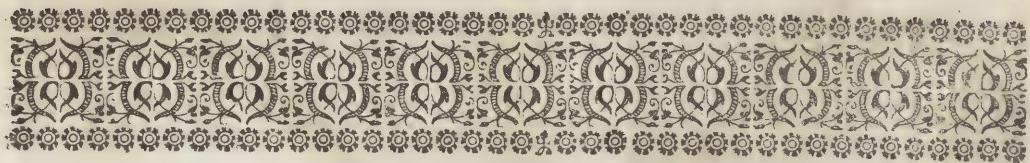
For Floors, there are enough already laid down in *Pag. 30, 31, 32, 33, and 34.* to open the Mind for the finding many others. Thus far we have had to do with the Rooms, as Hall, Chamber, or the like, the several Parts whereof are fully delivered: The Moveables therein shall be shewn hereafter.

PRACTICAL

57



57

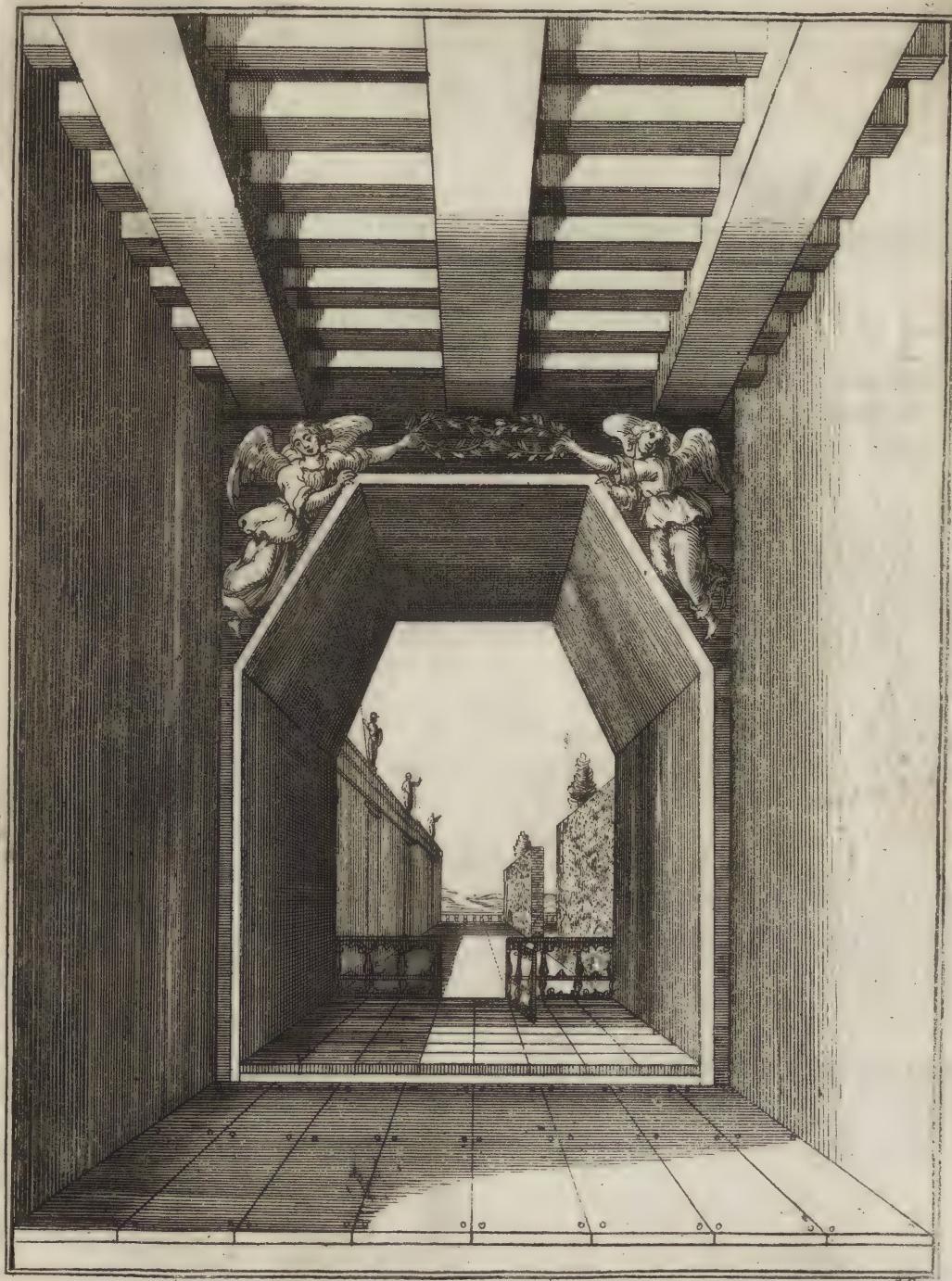


THIS Figure shews the Cieling just now described, distinct and clear of the Lines wherewith the former was embarrassed.

The Construction of the Gate shall be shewn hereafter.

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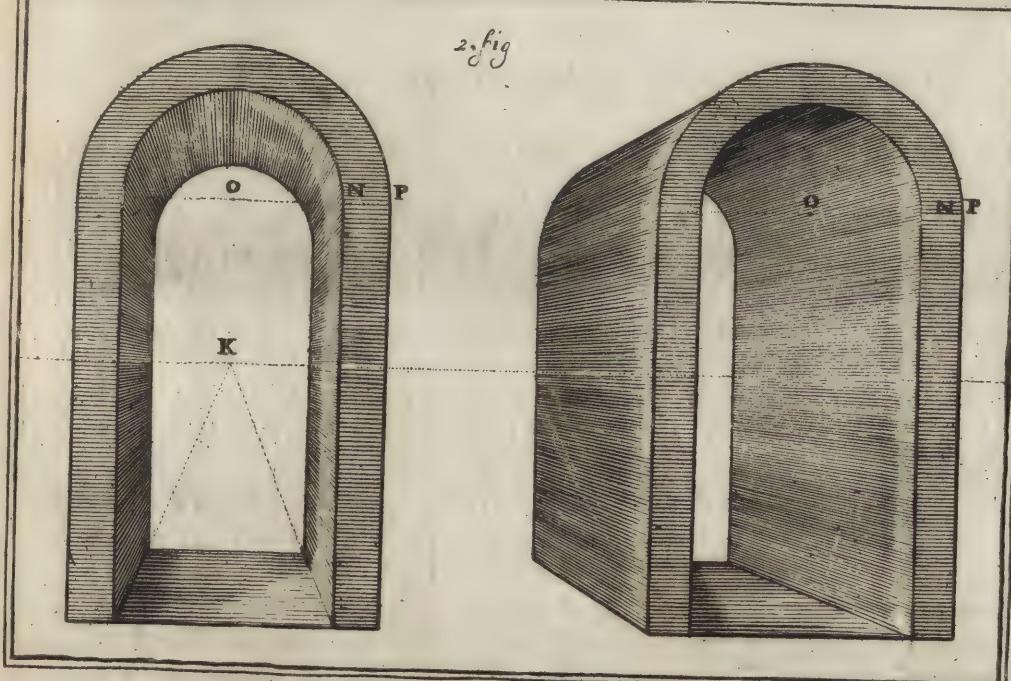
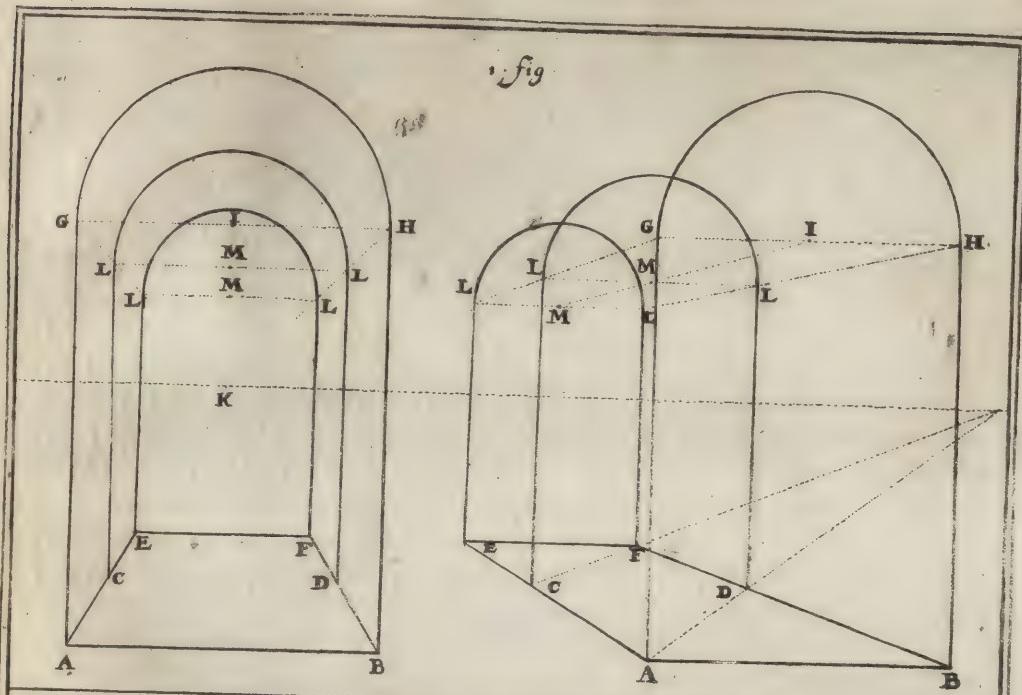
Circular GATES and ARCHES viewed directly.

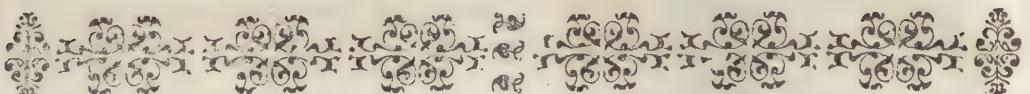
HAVING given sufficient Instructions for Halls, Chambers, Windows, and *square* Doors, or Gates, we proceed to the Practice of *round* ones.

Suppose then ABCDEF to be Pilasters on a Plan, to place Arches thereon ; divide the upper Breadth GH into equal Parts, in the Point I, on which setting one Leg of your Compasses, with the other, describe a Semi-circle GH, for the first Arch.

To make all the rest of the same Height and Breadth, draw Lines from the Point of Sight HG to the Point of Sight K, and through the two Points L, L, where those Rays cut the Perpendiculars CD, draw Parallels to GH : These Parallels being divided into two, and Semi-circles struck from them, as in the first, you will have the second and third Arch. To find the Middle of those Parallels L, you have only to lay the Ruler in the first Centre I, and draw a Line to K, which will cut them all precisely in the Middle MM, and give the Points for the Semi-circles to be drawn from. Those viewed in Front, and those by the Side, are all performed the same Way ; as appears from the first Figure.

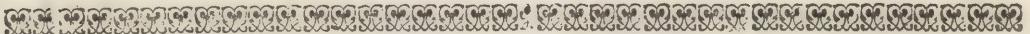
If it be required to make an Edge, or Band, of equal Thickness throughout, you are only to use one Center as O, from which the Thicknesses NP of the lower Figures are formed. The rest is all performed as already directed, by drawing Lines to the Point of Sight K. The last Figures shew how all Kinds of simple Vaults, only consisting of a Semi-circle, are to be formed : As to the Enrichment thereof, we shall have Occasion to speak hereafter.





Round ARCHES over Pilasters viewed in Front.

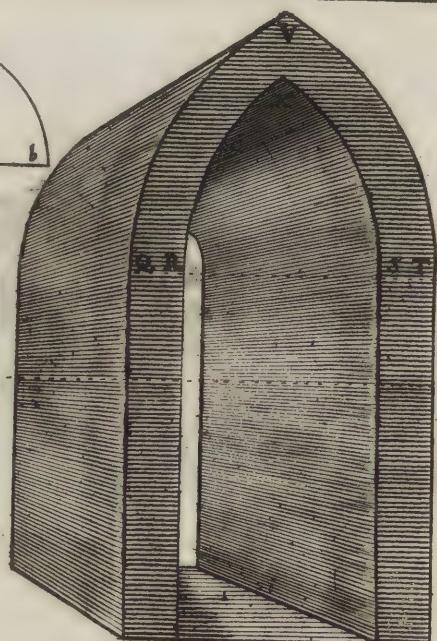
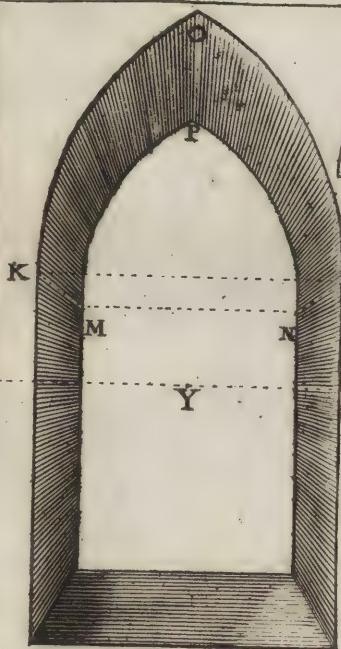
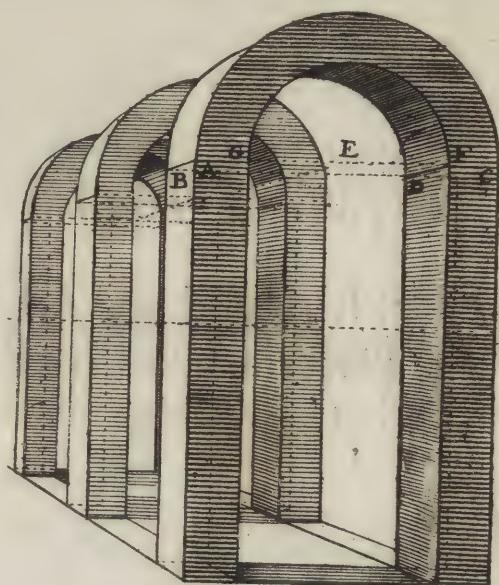
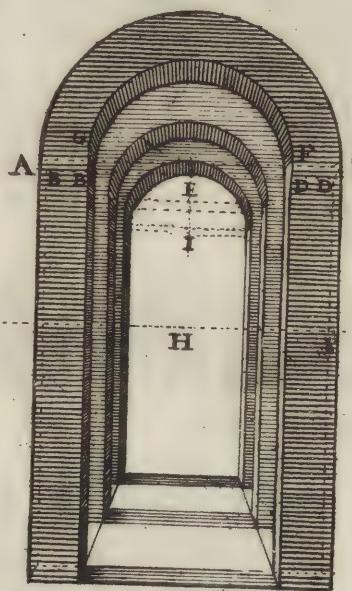
THE Out-line of the last Plate readily directs how this is to be done, the Method being the same in both. In the present there are a few more Lines, but not any Thing more of Difficulty: For, drawing Parallels to the Base Line over the Tops of the several Pilasters AB, CD, and dividing the first of them into equal Parts, from the Middle E, as a Center, describe the first Semi-circle AC, without removing the Compasses, from the same Center, describe the Band or Thicknes AGFC; lastly, from the Center E, drawing Lines to the Point of Sight H, the Ray EH will give the middle Points of all the Parallels for describing Semi-circles over them all, from BD to the last, I. The Method is the same for that in the Side-view.



GOTHIC ARCH, or Arch in the third Point.

THE drawing of this is as easy as that of the circular Arch. Having laid down the Breadth KL, set one Foot of your Compasses in K, and directing the other to O, strike the Arch LO; then remove your Compasses to L, describe the Arch KO, and you will have an Arch in the *third Point*, KOL. Do the same from M and N, and you will have the *second*, or *inner Arch*, MPN. The second Figure, *in the third Point*, has a Band or List all round it, which is described from the same Centers: Thus, *ex. gr.* from the Center R the Arches SX and TV are swept; and from the Point S the Arches QV and RX: All the rest is drawn to the Point of Sight Y.

Another *third Point*, or *terzo Acuto*, is represented in Figure +; the Diameter whereof, *a b*, being divided into three equal Parts X, and one Foot of the Compasses set in one of the Divisions, as *c*, and with the other the Aperture *c b* taken, the Arch *b e* is struck therewith; then remoying the Compasses to *d*, the Arch *d a e* is struck, which is an Arch in the *third Point* as well as the former; and either of them may be used at Discretion. Those in old Gothic Churches come nearest the former Kind.





Sequel of the former FIGURE.

WE here add an Arbour of a Garden, the Performance whereof is in all Respects the same as that of Arches viewed in Front.







To describe, and put in Perspective, round Arches and Doors.

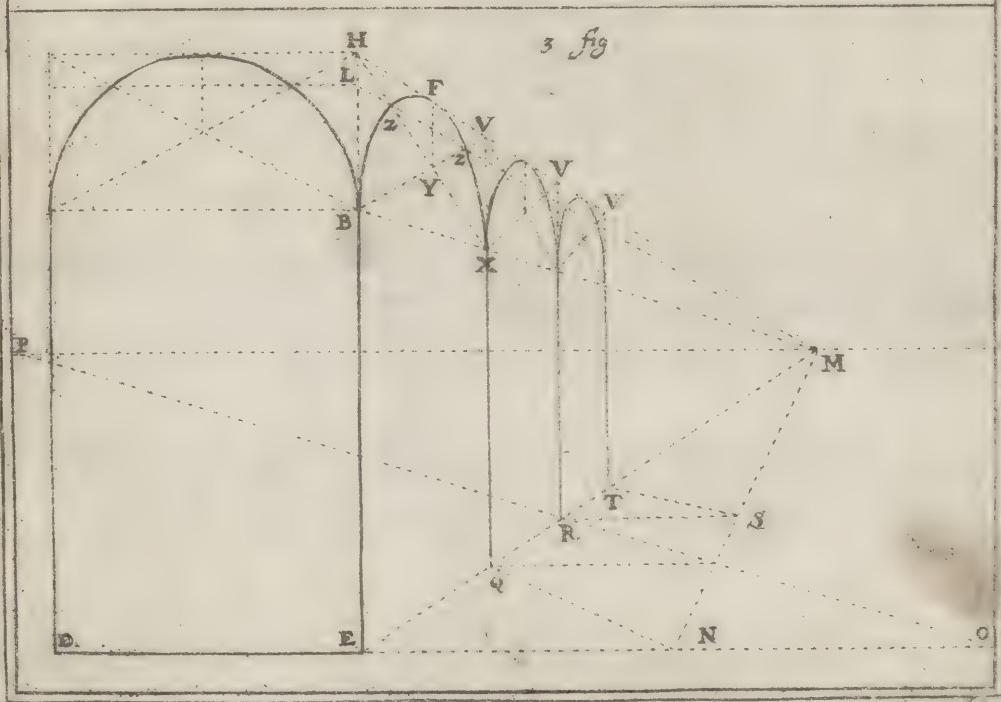
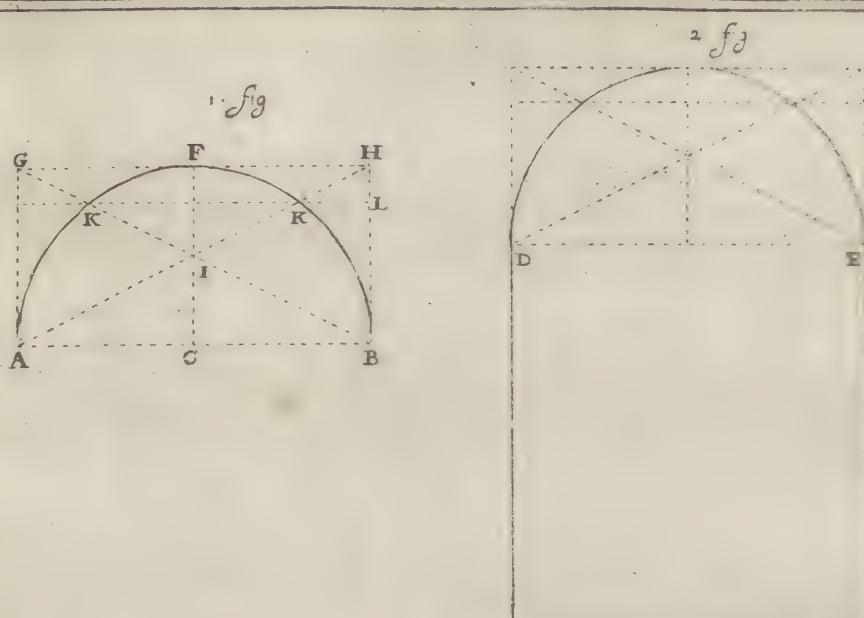
THE Circle being somewhat difficult to put in Perspective, requires a Number of previous Lines and Points : To find which the more readily, the first Figure here added is to be understood ; which shews, that to describe a Semi-circle upon a Diameter A B, there needs no more than to set one Foot of your Compasses in the Point C, in the Middle of A B, and with the other to sweep a crooked Line from A to B. And thus is the Semi-circle to be transferred upon the Elevation D E, Fig. II. for a circular Gate or Arch.

Now to put it in Perspective, it is to be divided into any Number of Parts, and the more the better ; as already observed in Pag. 28. and as we shall hereafter have occasion to shew, when we are speaking of crois Vaults. The present Semi-circle we shall only divide into four, and that by drawing a Parallel to A B, raising it in the Point F, which Point will be the Middle of the Semi-circle ; then erecting two Perpendiculars from A B, cutting the Parallel F in the Points G H, and from the Corners A B G H drawing two Diagonals A H, G B, intersecting each other in I ; from the Point I raise a Perpendicular C I F cutting the Circle in two : And the Diagonals will cut it into two other Parts in the Points K K, thro' which a Line L K is to be drawn Parallel to the Base Line : All which Divisions and Measures are to be transfer'd to Fig. III. to put it in Perspective.

First then draw a Line from the Angle E to the Point of Sight M, and another from the Point N (which is the same Distance from E, as D is) to the Point of Distance P ; which latter cutting the Ray E M in the Point Q, E Q will be the Width of the first Arch D E in Perspective. Then drawing a Line from O to the Point P, it will cut the second Arch in the Ray E M, or the Point R. As there is no more Room on the Base Line to take the third Arch, a Point must be drawn from N to the Point of Sight M ; and through the Point R a Parallel to the Base Line R S : Now as R S is under the same Angle with E N, it is the same Breadth, as has been already prov'd in the Beginning of the Book ; therefore drawing a Line from S to P, it will cut the Ray E M in the Point T, which gives the third Arch.

Proceed then to raise Perpendiculars V V, &c. from the three Points Q R T, which intersecting the Ray H M, will give the highest of the Arches ; then from the Ray B M, which gives the Bottom of the Semi-circle, draw Diagonals B V, H X, which intersecting each other, give the Place of the Perpendicular Y F, that divides the Arch into two ; and drawing the Ray L M, it will cut the Diagonals in two, and the Arch in four ; lastly, connecting the Points B Z, F Z X, with curve Lines, you will have the first Arch : And a Method which will give you infinite others. The same serves not only for Arches and Doors, but also for Vaults, Bridges, and other Things that require the Semi-circle ; for which Reason it is that we decline speaking any Thing farther of the two latter.

The same Method may likewise serve for Church Windows, only one or two upright Posts are to be added to fasten the Glass to.



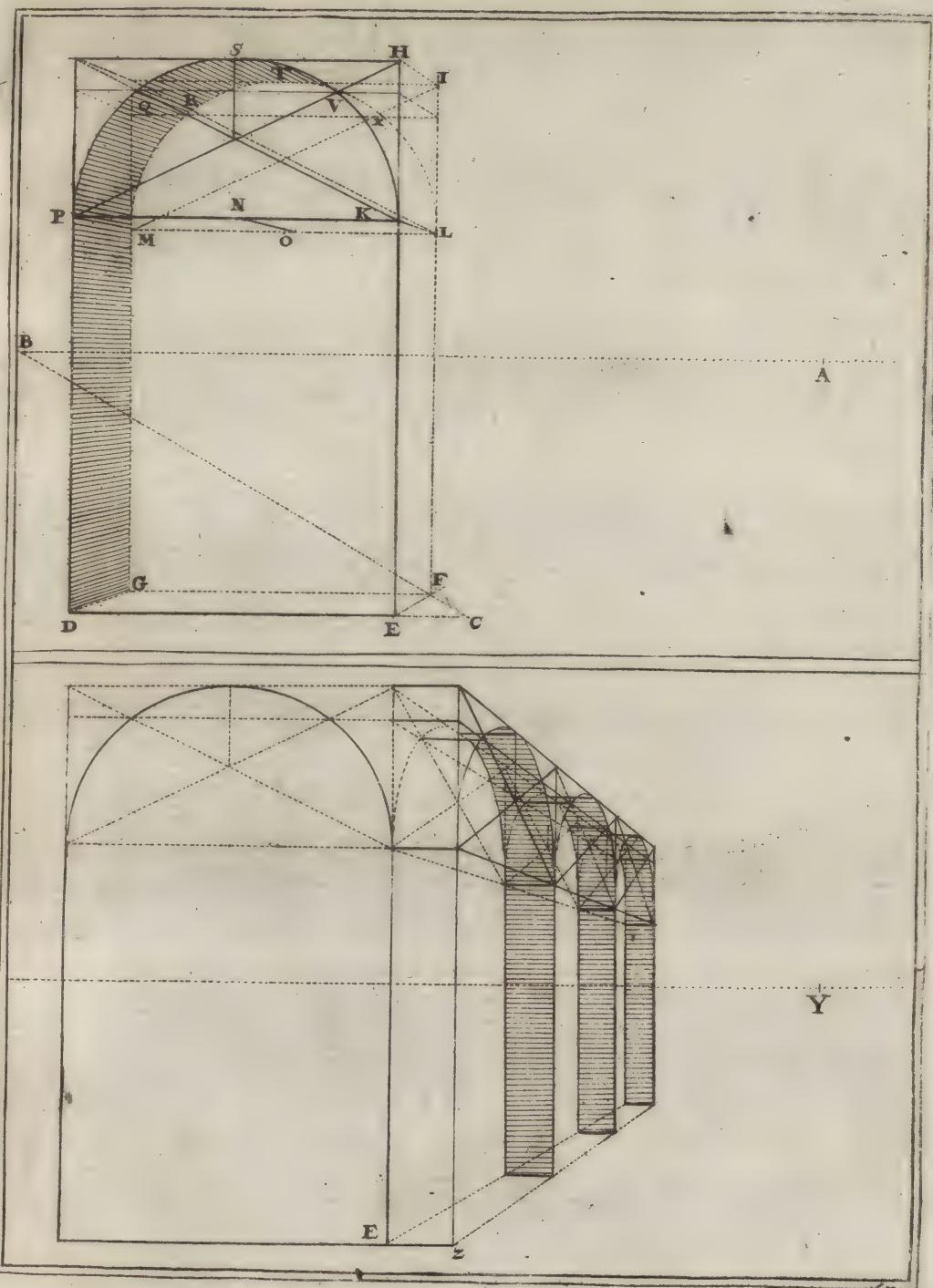
R

To describe, and put in Perspective, double ARCHES and GATES,
i.e. such as shew their Thickneses.

WHAT we have hitherto done is merely for the Out-line, which being doubled gives the Breadths and Thickneses of Arches, and what supports them, by only connecting all the Intersections of each by Right-Lines: For Example,

Having describ'd the first Line D E, and drawn Lines from D and E to the Point of Sight A, set the Thickness on the Base-Line E C, by drawing C to the Point of Distance B, and in the way cutting the Ray E A in the Point F ; thro' which drawing the Line G F parallel to the Base-Line, it will cut the Rays D A and E A in the Points F G, and give the Thickness requir'd. Then from F G erect Perpendiculars, and from H draw a Line to A, the Intersection whereof with the Perpendicular F I gives the Height thereof. From this Line you are to find the Line of the Center of the Semi-circle, by drawing a Line from K to the Point A, which gives the Point L, a Parallel drawn thro' which will have the Center of the hinder Semi-circle upon it, as N is the Center of that before. This Line M L is to be divided into two equal Parts, by drawing a Line from N to A thro' A O Then setting one Leg of your Compasses in O, with the other describe a Semi-circle M L, to be divided like that in the preceding Figure. Lastly, draw Right-Lines from the Divisions of the one to the other, that is, from the fore Semi-circle to the hind-one, to connect the two into one ; as in the Figure M is join'd to P Q, to R S, to T V, to X L, to K.

For circular Arches, &c. view'd in Front, as D E F G, there is no need of so many Divisions, it being sufficient to find the Line M L, in order for the describing of the Semi-circle, which refers to the first N P Q; but I have made them designedly, for fear of confounding the Letters with the Lines of the lower Figure, where the Arches are view'd obliquely, tending all towards the Point of Sight Y. Such Arches would give their Thickness by repeating the Operation already laid down for Fig. I. twice over, and joining the Divisions of the one to the other, as already observ'd, and as is express'd in the present Figure, to which having given the Thickness E Z, I have drawn the Line E in Dots, and Z a full Line, in order to avoid Confusion, and to intimate, that whatever is done with Dots, is not intended to be seen when the Draught is finish'd.





Another METHOD for Circular Arches.

THE Arches in Front, which we have hitherto describ'd, are all perform'd to the last Exactness; but the Process is a little long and tedious: we shall now add another, equally just, but much more expeditious.

Having described a Semi-circle, or a whole Circle, BH I, from the Centre A, from the same Centre, and the Extreme of the Diameter B, draw Lines to the Point of Sight C; then setting the Breadth, or Thickness requir'd, on the Line BI, as here DA, from the Point D draw a Line to the Point of Distance E, and through F, the Point where DE and AC interfect, draw a Line parallel to the Base, till it cut the Ray BC in the Point G; this done, setting one Leg of your Compasses in F, and in the other taking the Distance G, describe a Semi-circle, or Circle, which will be the Thickness of the Arch, or Sweep: As is seen in the Figures. All the Lines KK, &c. are to be drawn to the Center A, and the others, L, to the Point of Sight C. The same may serve for circular Windows built of Stone, in which Case the Lines will represent the Joints; as also for Tons, Vats, &c.

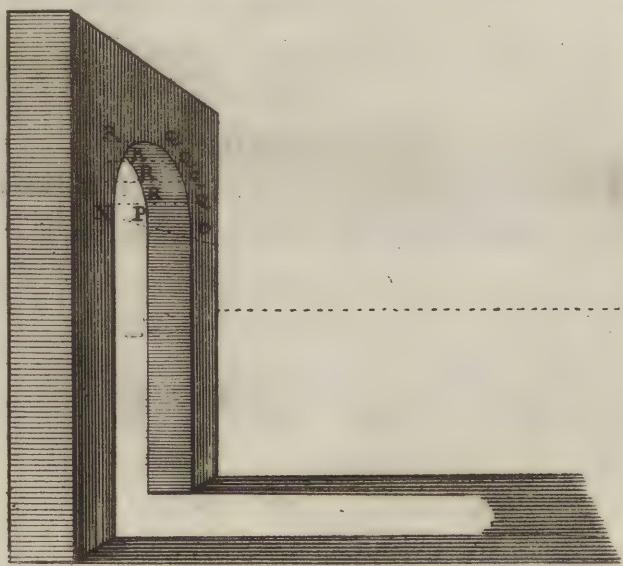
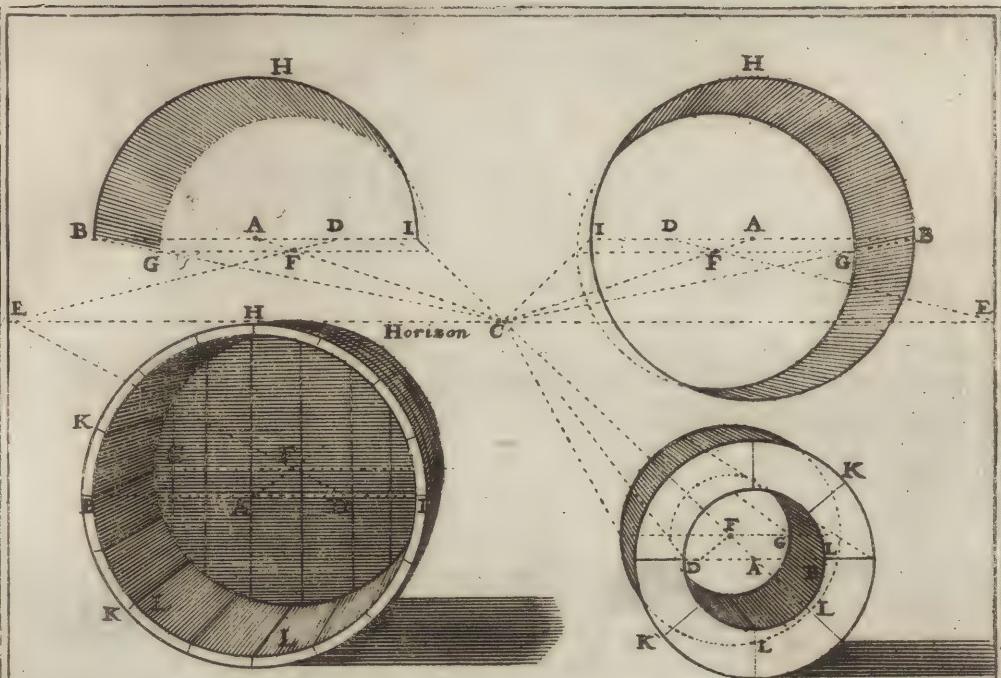


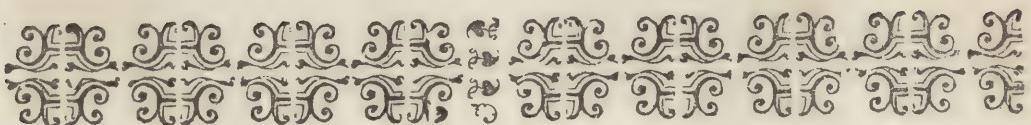
ARCS view'd Obliquely in Perspective.

THE following Method may serve when a Person is straighthned, and does not desire to be so very exact; as also to avoid a Multiplicity of Lines, which in the preceding Method is indispensible.

Having form'd the first Arch NO as already directed, a-cross it draw little Parallels to the Base in any Number at Pleasure, as here QQ, &c. then taking in your Compasses the Breadth of the Spring of the Arch, as PO, set it off on the little Parallels Q, by which Means you will have the Points RR; thro' which a Curve Line being drawn, will form the Thickness of the Arch.

'Tis certain, that, according to the Rules of Perspective, Objects appear the larger as they are the nearer to us; of Consequence, therefore, the Line OP should be the smallest: But the Difference is here so very small, that it is not worth the minding. Beside, we do not give this as a constant Rule, but only for a Shift in Cases of Necessity.





FLAT ARCHES.

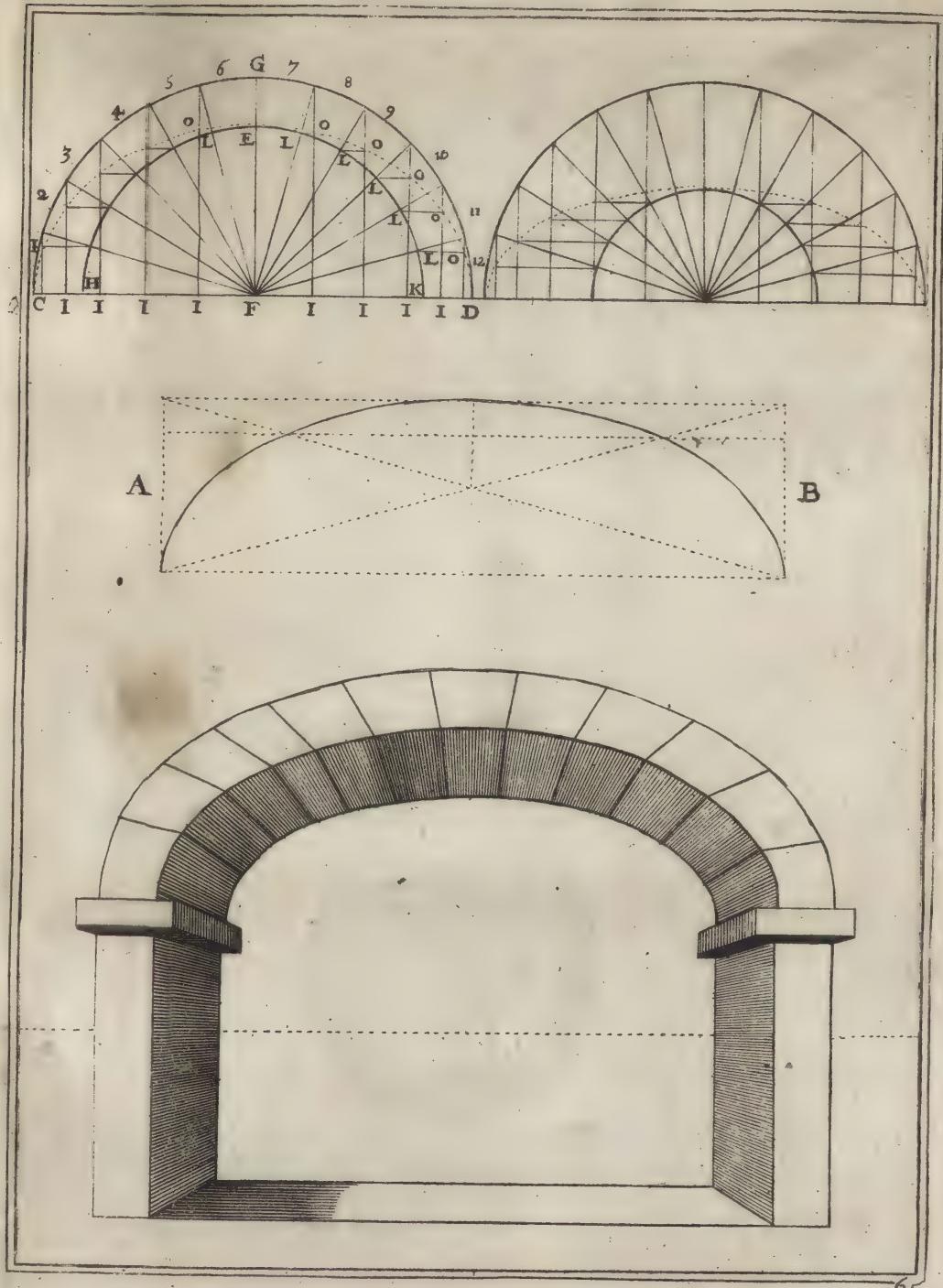
THE Method of putting these in Perspective is the same with that of the Semi-circular Arches, as appears from the Figure A B. All the Difficulty is in finding the Out-line, which is done two Ways.

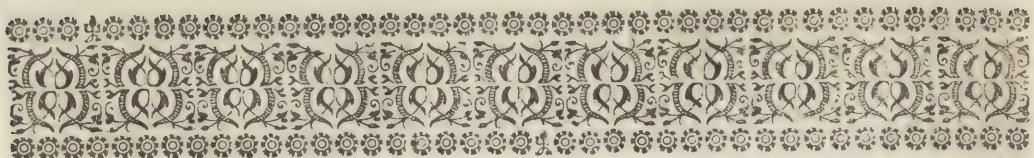
The first by two Centers and a String, the Method already mention'd for describing an Oval; these flat Arches being, in Effect, Semi-ovals.

The second is thus: Suppose the Line CD given you to raise a flat Arch upon of the Height E F, from the Center F describe a Semi-circle C GD, and divide it into any Number of equal Parts at Pleasure, as is here done into twelve; and from all these Divisions draw Lines to the Center F; then again, from all these Divisions draw Perpendiculars to the Diameter CD, as are here the Lines O L; this done, describe a Semi-circle of the given Height of the Arch, as here HEK; and thro' the Intersections this lesser Circle makes with the Divisions of the greater, draw little Parallels to meet the Perpendiculars falling from the same Divisions, for Instance LO, L O, &c. and of the several Points O connected together form the Arch, as is here done.

The other Figure makes the Arch still flatter, and by the same Rules it may be made of any Lowness at Pleasure.

The Figure underneath shews one of these Arches in Perspective, such as it should appear, when finish'd, in a front View. We say nothing of the Method, as having already intimated it to be the same with that for the Semi-circle.

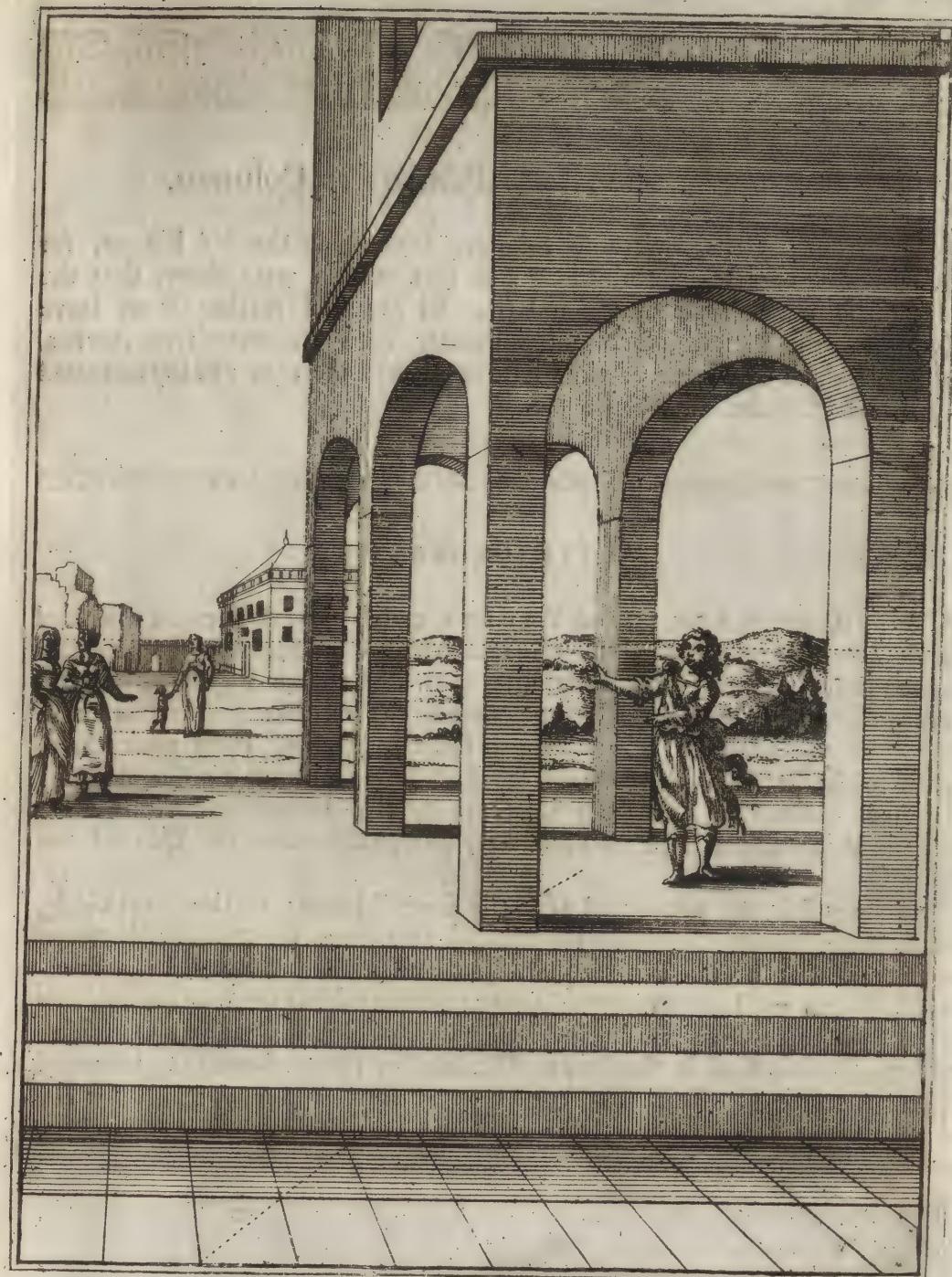




IN this Figure we have an Instance of the fine Effect of ARCHES when well center'd, that is, when they have their just Rotundity.

For the Steps and Figures, we shall have occasion to treat of them hereafter.





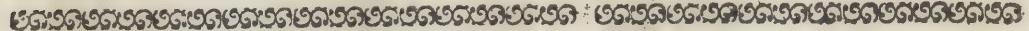
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S



To raise ARCHES upon Pilasters or Columns.

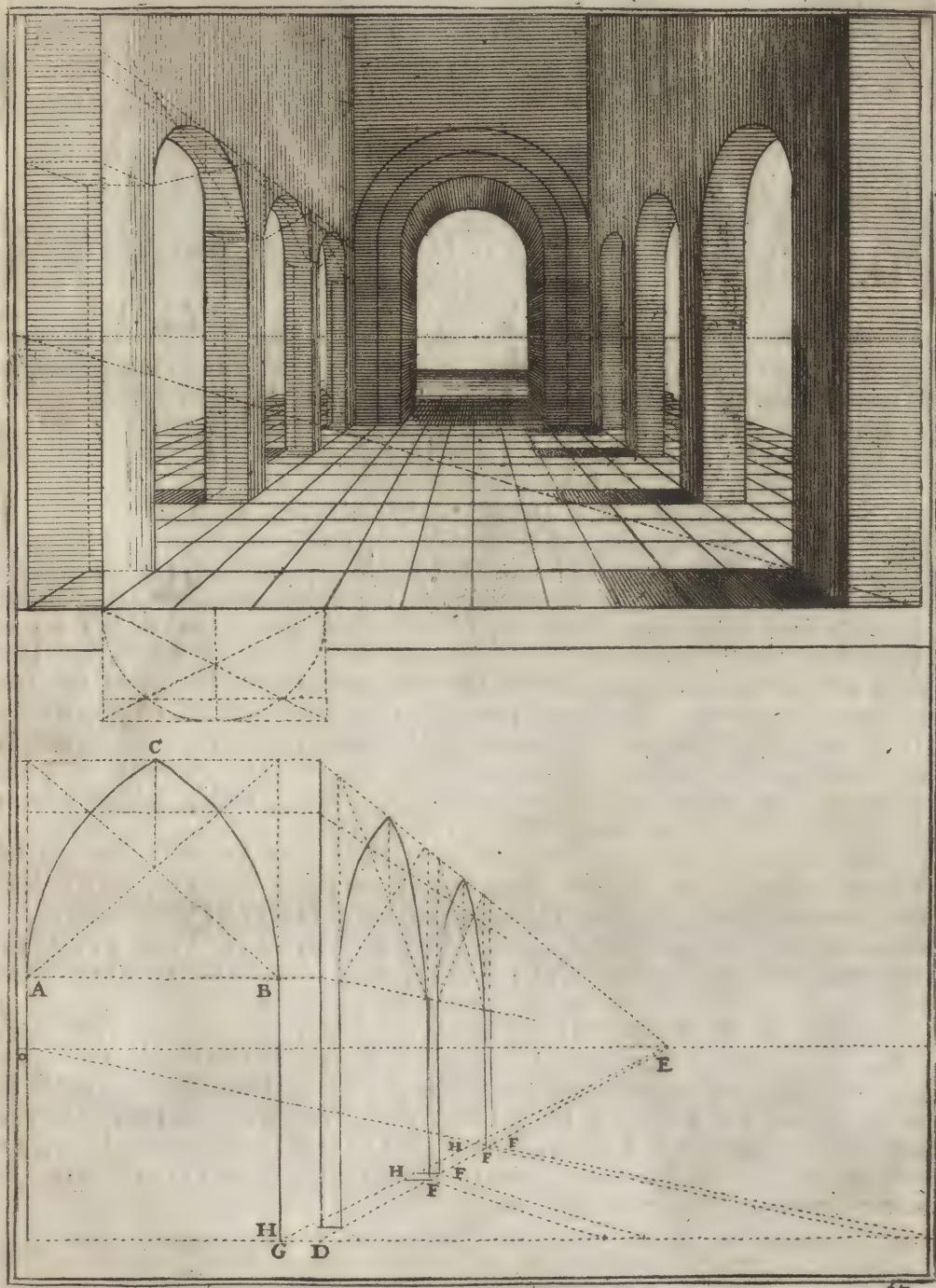
IT looks as if there were no Pilasters formed in the last Figure, for which Reason I determined to add this, which may shew, that the Method is precisely the same, and that all required farther, is to leave Room for the Breadth, &c. of the Pilaster between every two Arches, which is done by Means of the Plan, or Base Line; as already directed for *Circular Arches*.



GOTHICK ARCHES.

GOTHICK ARCHES and VAULTS, called also Arches in the *third Point*, are performed in the same Manner as Semi-circles; so that having done one, you will do the other with Ease: The Figure shews the rest. As to the Out-line, we have already shewn that nothing is more easy. The Breadth A B being given to form an Arch of, open your Compasses to the Breadth, and setting one Leg in A, with the other describe the Arch BC; then removing them to B, describe another Arch AC; and the Point wherein the two intersect, will be the Point or Apex of the Arch C.

As the rest is all performed after the same Manner as the Semi-circle, we shall not repeat it: All the Business is, that here are Pilasters between each two, that are not in the other. This may serve to confirm and exemplify what we have already said, that all that is to be done is to draw Lines from these Divisions on the Base to the Point of Distance O, which will cut the Ray D E in the Points F F, &c. for Perpendiculars to be raised upon; then setting off the Thickness G, and drawing the Ray GE for the Breadth of the Pilasters H, from the same Point H erect Perpendiculars, to be connected to the other by right Lines, &c. as in the Semi-circle.



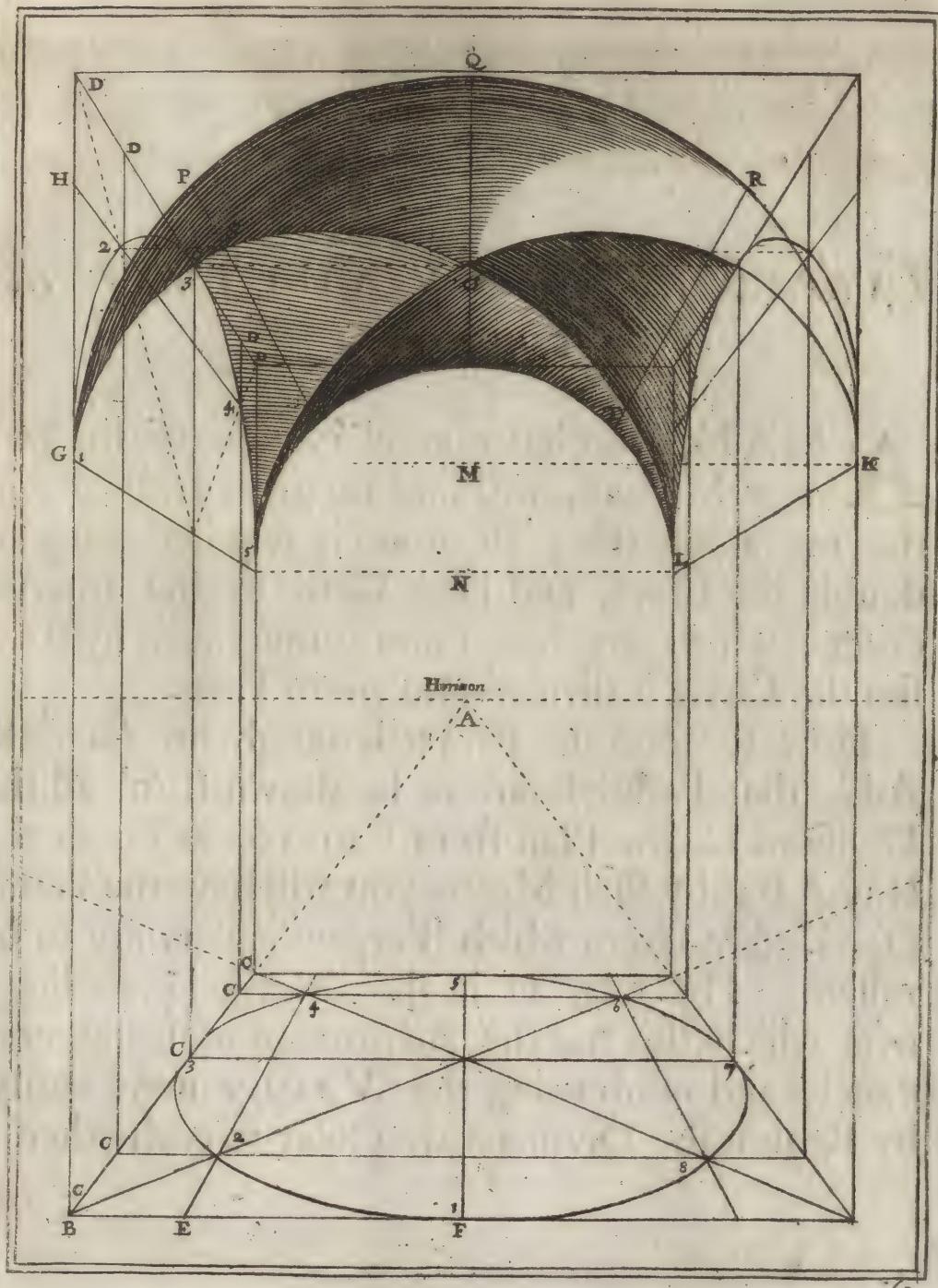


To find CROSS VAULTS in Perspective.

THE Reader must remember, or have recourse to, what we have said in Pag. 28. where, speaking of putting a Circle into Perspective, we divided it, for the greater Exactness, into sixteen Parts; but as in such a Division there necessarily occur a great Number of Lines, we have here chose to take up with a Division of eight Parts, which if it be the less exact, it will be the less confused. The other Division we shall resume in the following Page.

Having then formed a Plan of a Circle divided into eight Parts, 1, 2, 3, 4, 5, 6, 7, 8, Parallels to the Base Line are to be drawn through the several Divisions thereof, as far as the Ray BA, which will give the Points CC, &c. on which erecting Perpendiculars CD, CD, &c. the first of them, BD, being the Line of Elevation, all the Measures of the Semi-circle BEF must be set thereon, by which Means you will have the Points DHG; from which Rays are to be drawn to the Point A, and in the Intersections of the Perpendiculars CD, you will have the same Divisions as in the first, second, third, fourth, and fifth PLANS. For a Semi-circle, draw curve Lines as in the Arch of the first Side, the Divisions whereof are to be transferred to the other, in order to have two collateral Arches; from the Springs whereof two Circles are to be described; the one before GH, from the Center M; the other in the Bottom 5L, from the Center N. And thus you have the four Arches ordinarily found in Cross-vaults. All that remains is, to make the Cross, or crooked Diagonals, resting on the Corners G 5, KL, and passing through the K or Groin O.

Now as the Circle is divided into eight Parts, the Arches, which are but Halves of Circles, are only to contain four Parts; the Semi-circle GK, therefore, is to be divided into four Parts, in the Points GPQRQ, which are to be drawn to the Point of Sight A, as far as the Bottom of the Circle 5L. Now what follows is the great Secret of the Cross, viz. That Parallels to the Horizon are to be drawn from all the Intersections of the Circle on the Side 1, 2, 3, 4, 5, in such Sort, as that G, which is the first Division of the Circle, touch the Intersection 1 in a Point; that from 2 a Parallel be drawn to the second Division P, and the Point S to be marked; that from 3 another Parallel be drawn to the third Division which will give O, the Place of the Key or Groin; and from 4, another to the Point T; lastly, connecting GSOTL with curve Lines, you will have a Diagonal; and doing as much for the other Side, you will have the entire Cross, and the Vault compleat.





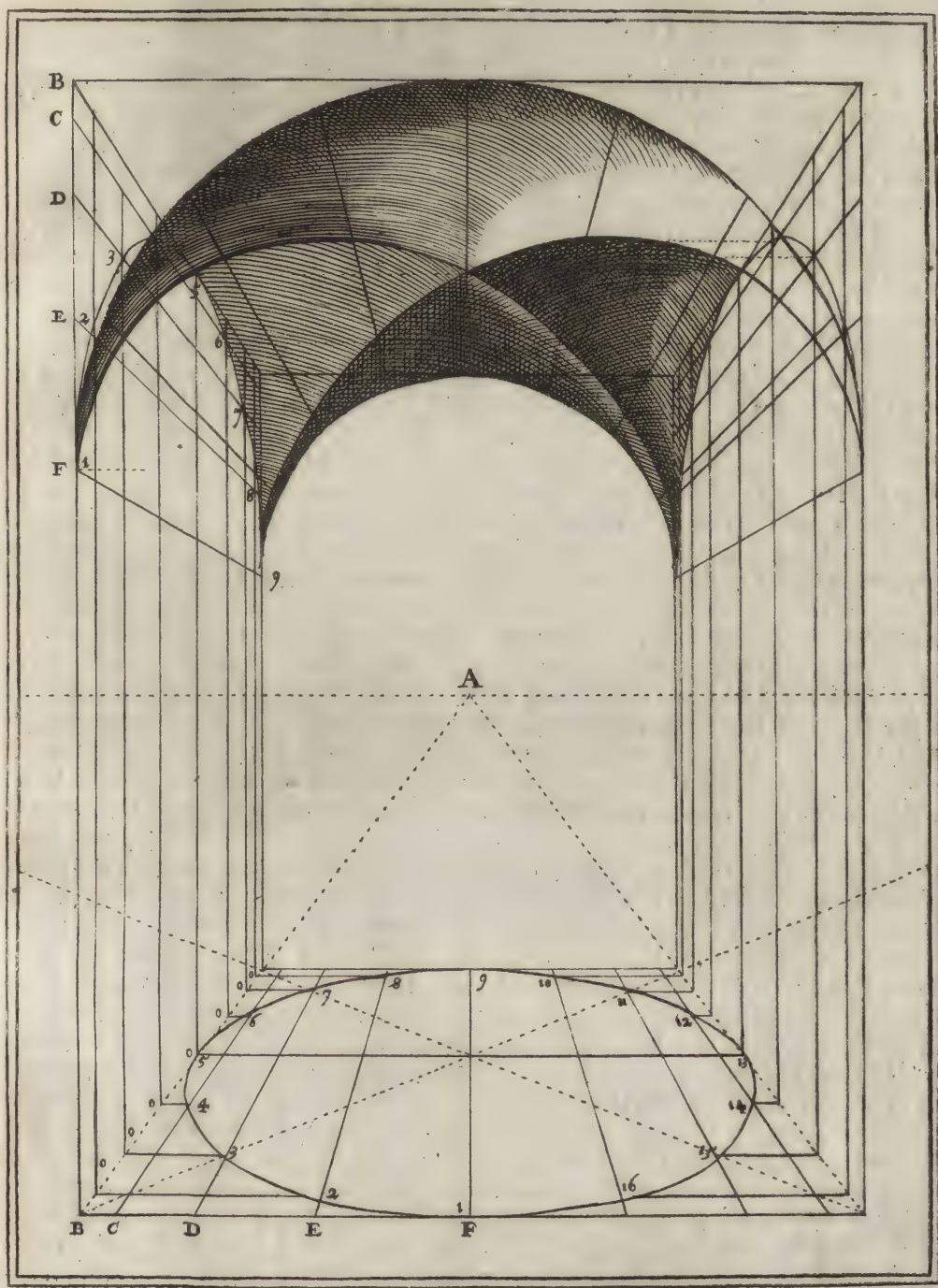
To draw the same VAULT more accurately.

A MAN, who has a good Notion of the former Method, will find no great Difficulty in the managing this; all that is required being to double the Lines, and take Care of the Intersections, which are here more numerous, by Reason the Circle is divided into more Parts.

How to form the PLAN is taught in *Pag. 28.* Add, that Parallels are to be drawn thro' all the Divisions of the Plan from I to 16, as far as the Ray AB; by such Means you will have the Points O, O, &c. from which Perpendiculars are to be raised. The rest, as in the Method preceding; over which this has the Advantage of being more exact, and of drawing the VAULT more easily, by Reason the Divisions are closer to each other.

PRACTICAL

69



69

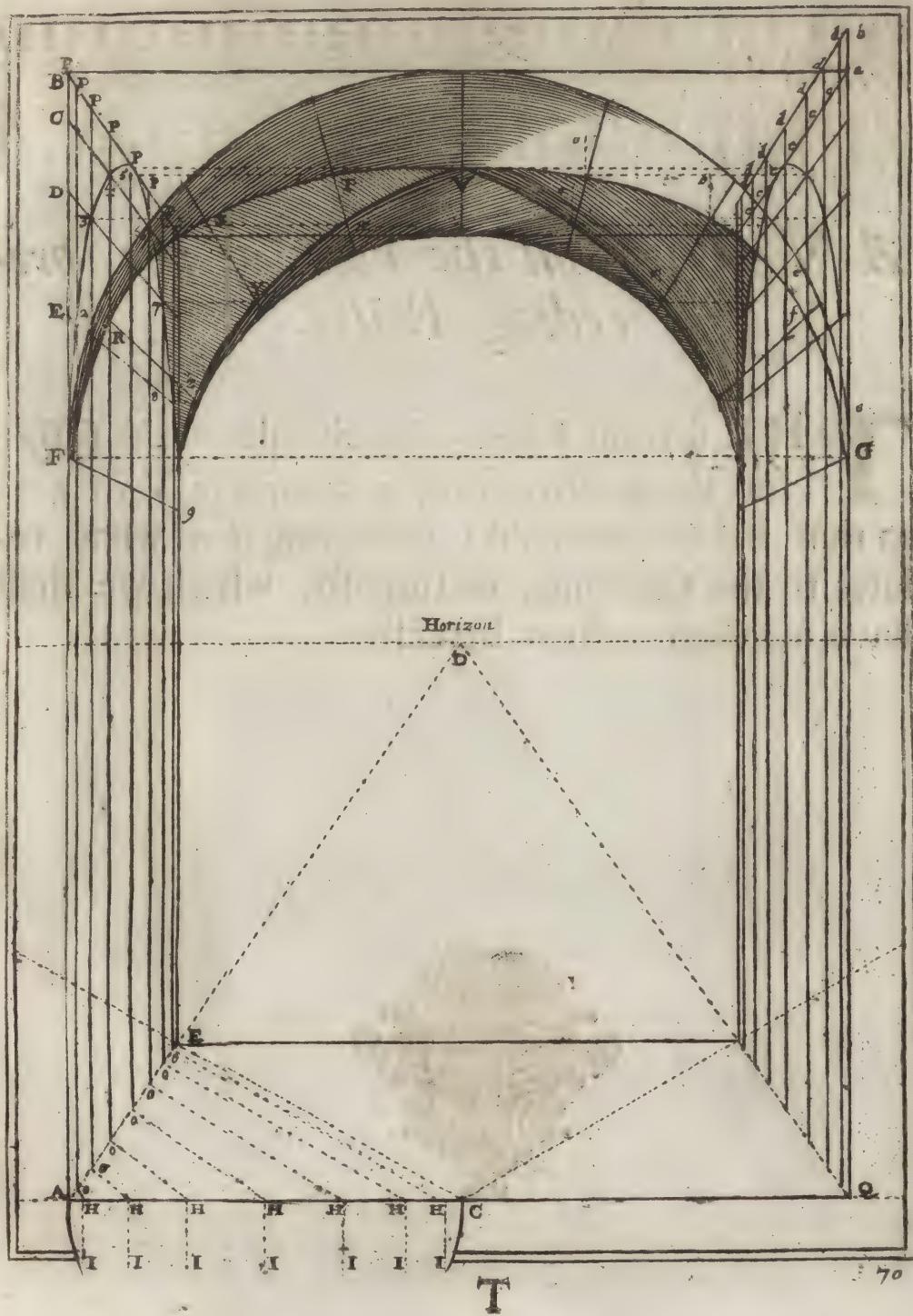
To form narrow VAULTS.

THERE are two Processes in this Figure; the one for contracting or straightening Side-vaults; the other for giving the Thickness to the Cross. We shall begin with the first.

The two Methods for Vaults already laid down, suppose them perfectly square, that is, that their Breadth and Depth, or Distance, is equal; which holds both in those represented in Front, and those in Side-views: But a Person only instructed in these, would find himself strangely at a Loss were he put to construct a Church, where the Side-arches are usually much narrower than those in the Front or Middle.

We proceed, therefore, to offer you an expedient whereby you'll be enabled to make the Side Arches of what Dimensions you please, and that by Means of the Base Line A Q. Suppose then the front Arch A Q forty Foot broad, and the Side Arches limited to fifteen or twenty, you are now, according to the Instructions in p. 17. to set this Measure on the Base Line, and to draw a Line from the same to the Point of Distance, by which you will have the Depth of the same Figure in A E. Thus, in the present Example, AC being supposed twenty Foot, a Line drawn from C to the Point of Distance, (which here is supposed beyond the Limits of the Paper) cuts the Depth twenty Foot in the Point E; then returning to the Base Line, an Arch is to be struck at the Distance A C, and the Line, or Radius, to be divided into as many Parts as the larger Arch F G has Divisions, *viz.* eight; and from the several Divisions H, Perpendiculars H I to be raised; and from the same Points H, Lines to be drawn to the Point of Distance, intersecting the Ray A E in O, O, &c. Perpendiculars O P, O P, &c. are to be raised; then the Plan of this Semi-circle FG is to be made in some separate Place, and the Divisions thereof transferred from E to B. And since the Plan of the preceding Figure is equal to FG, take the Divisions of half of it, B C D E F, and transfer them upon the Perpendiculars A F; and from the Points E F D C B draw Lines to the Point of Sight D, and through the Intersections these Rays B C D E F make with the Perpendiculars O P, draw curve Lines, which will form the Side Arch. Then drawing Parallels through the Intersections 1, 2, 3, 4, 5, 6, 7, 8, 9, to the Divisions of the Arch F G, you will have Points F R S T V X Y Z, to form the Cross after the Manner already mentioned.

For the Thicknesses of the Nerves, or Branches, a little Line of Elevation must be made, *ab*, which I have here added at the Top of the Perpendicular raised from Q. This Line A B, being drawn to the Point of Sight D, cuts all the other Perpendiculars in the Point c d, and this gives the proportionate Heights to each Perpendicular raised from the Intersections of the Cross, that is, from the Intersections made to find the Out-line of the Cross: The first Elevation *a b*, for Instance, gives the first Perpendicular G e, the second Elevation *c d* gives the second Perpendicular F e; and so of all the rest in their Order, which all give Points e e; and which being connected by a crooked Line, gives the Thickness of the Nerves or Reins of the Vault: As is seen in half the adjoining Figure.





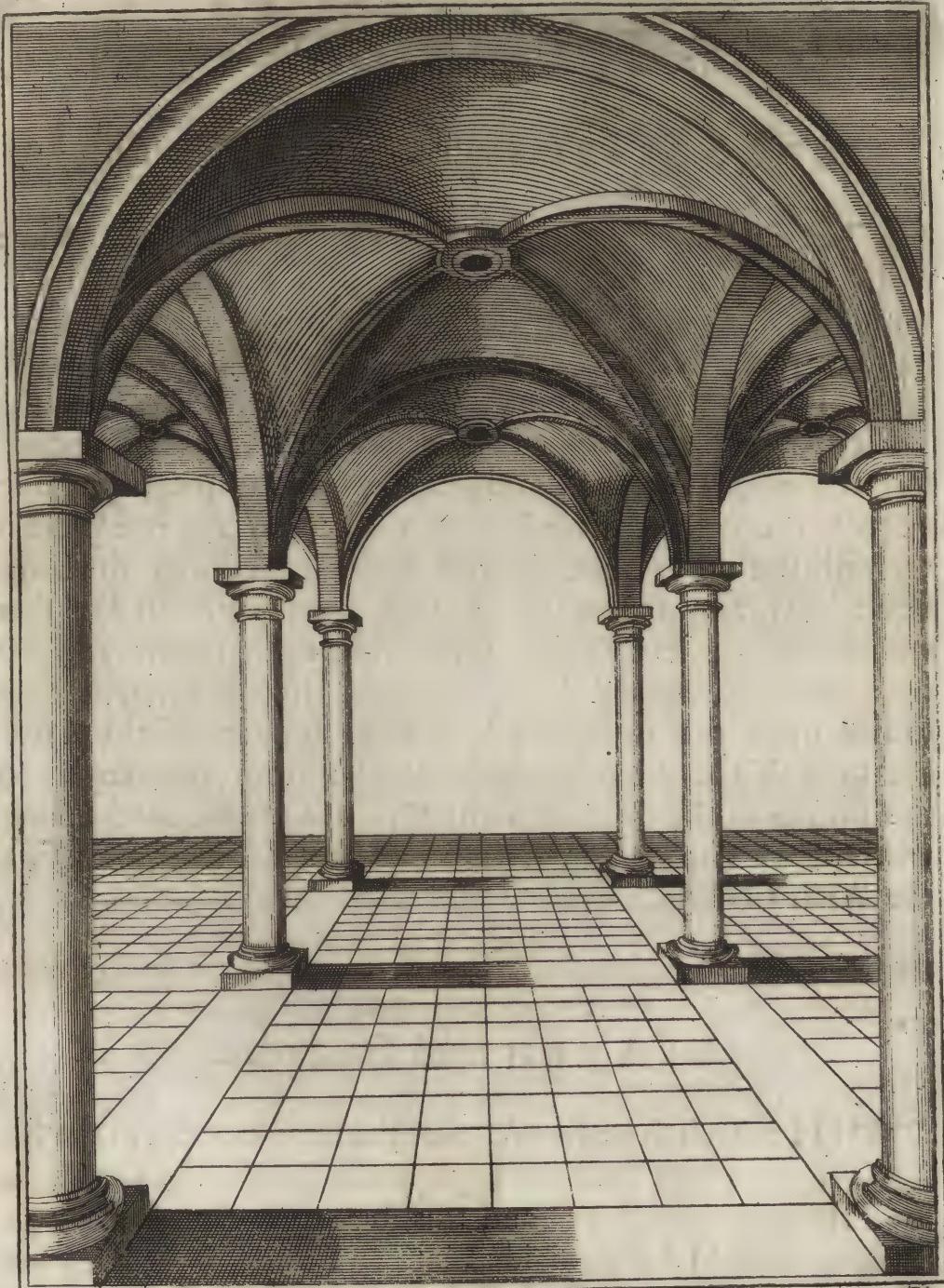
A VAULT on the Foot of the preceding Rules.

THE several Rules already deliver'd suffice for the constructing a complete VAULT, as that hereto annex'd; excepting for what relates to the Columns, or Imposts, which we shall have occasion to shew hereafter.



PRACTICAL

71



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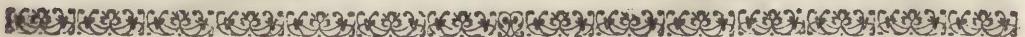
71



A R C H E S and G A T E S with three Sides.

TH E R E is another Sort of Ceiling which sometimes serves for a Vault over Doors and Galleries, and even Churches, having a pretty good Effect in Perspective, and easy enough to perform. I have added it here after the Circle, by reason it is form'd of a Semi-circle divided into Parts.

Having rais'd the Walls AB, describe a Semi-circle including the whole Breadth CD; then holding the Compasses open to the Width of the Radius EC, and fixing one Point in O, with the other strike an Arch upwards, cutting the Semi-circle in G, and another Arch EH from the Point D; then connecting the four Letters CDGH by right Lines, you will have a Semi-hexagonal Arch. A Semi-circle is likewise to be drawn upon the Breadth IK, for the Bottom of the Arch; and to divide it, Lines are to be drawn from the Angles of the former to the Point of Sight F; between the Intersections whereof with the Arch, right Lines being drawn, will form the Arch ILMK.

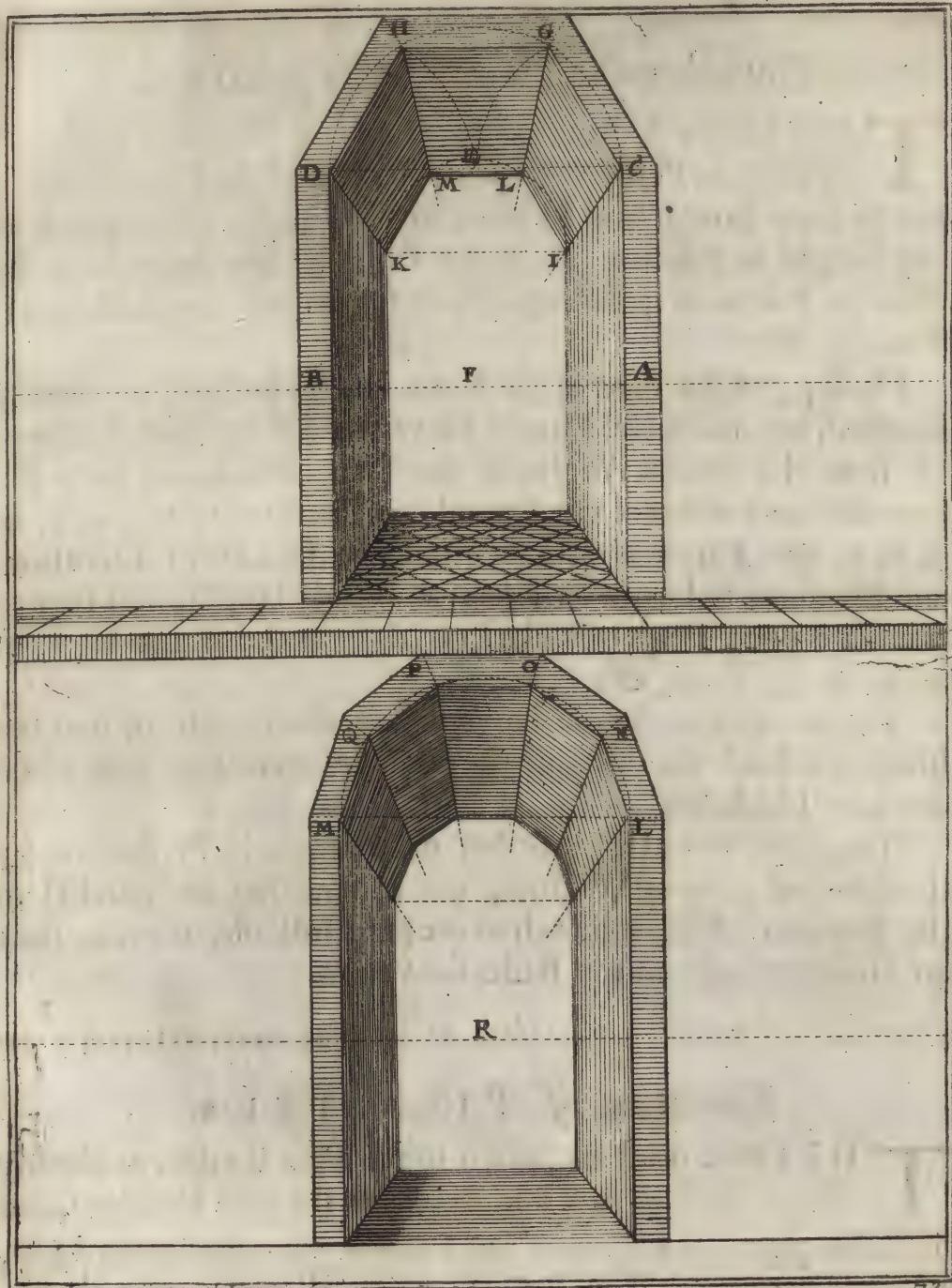


An A R C H with five Sides.

THIS Arch is perform'd after the same manner as the former; all the Difference lyes in the Division of the Circle, the first being into three, and this into five. Accordingly the Semi-circle LM being divided into five Parts, NOPQ, and Lines drawn from all these Points to the Point R, the rest is perform'd after the manner already laid down.

PRACTICAL

72



Elevations of Round OBJECTS.

THE Desire I have of enabling my Reader to put all Things in Perspective with the utmost Ease, has induc'd me to shew how round Figures, as Circles, are to be rais'd of any Height at Pleasure; and the same Method may serve for all other Rotundo's, as Cupola's of Churches, Amphitheatres, Towers, &c.

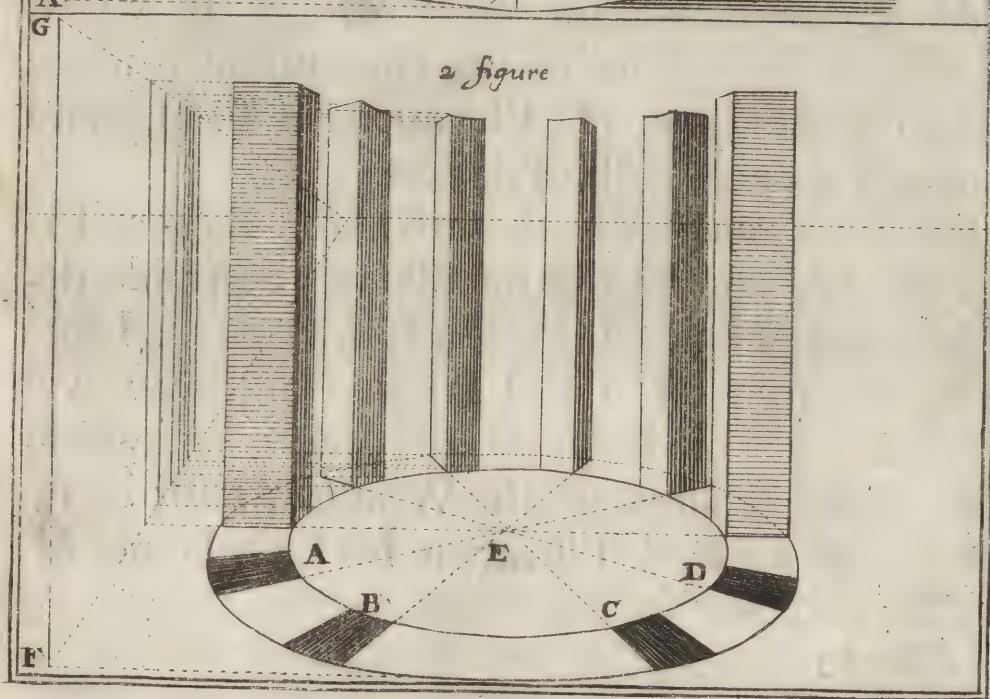
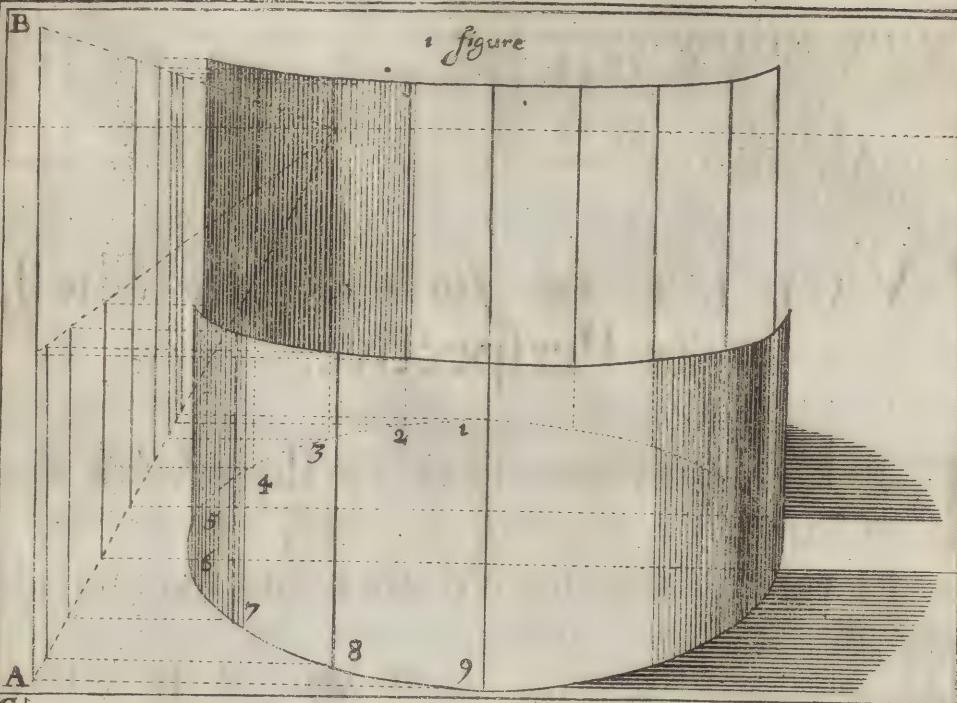
Having put the Plan of the Round in Perspective, as already directed, and rais'd the Line of Elevation A B by the Side thereof, from the several Angles of the Plan, which are here the several Points whereof the Round consists, *viz.* 1, 2, 3, 4, 5, 6, 7, 8, 9, &c. Parallels are to be drawn to the Line of Elevation, and Measures to be rais'd thereon as already taught, and thence transfer'd upon Perpendiculars rais'd from the Points 1, 2, 3, 4, 5, 6, 7, 8, 9, &c.

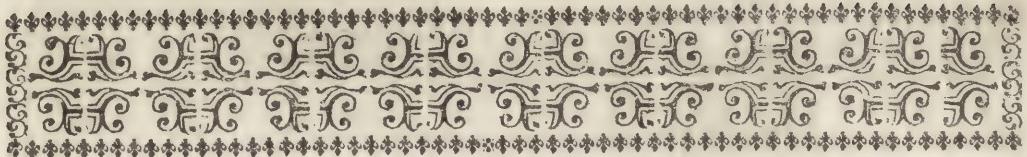
The Semi-circle before has but half the Height of that behind, and both the one and the other are mere Out-lines without any Thickness.

There is no round Figure but may be put in Perspective by this Method; round Figures, we mean, that are parallel to the Horizon: For as to such as are perpendicular thereto, they are already taught in the Rules for Vaults.

Elevation of PILASTERS.

TH E Circle must be drawn in the Plan double, as already shewn in *Pag.* 29. and between the two circular Lines must be plac'd the Plan of the Parts or Members to be rais'd, as those here mark'd A B C D, which all tend towards the Center E; then Perpendiculars to be rais'd from all the Angles of these Plans, and their proper Heights set off from the Line of Elevation F G; as already shewn in the preceding Figure.



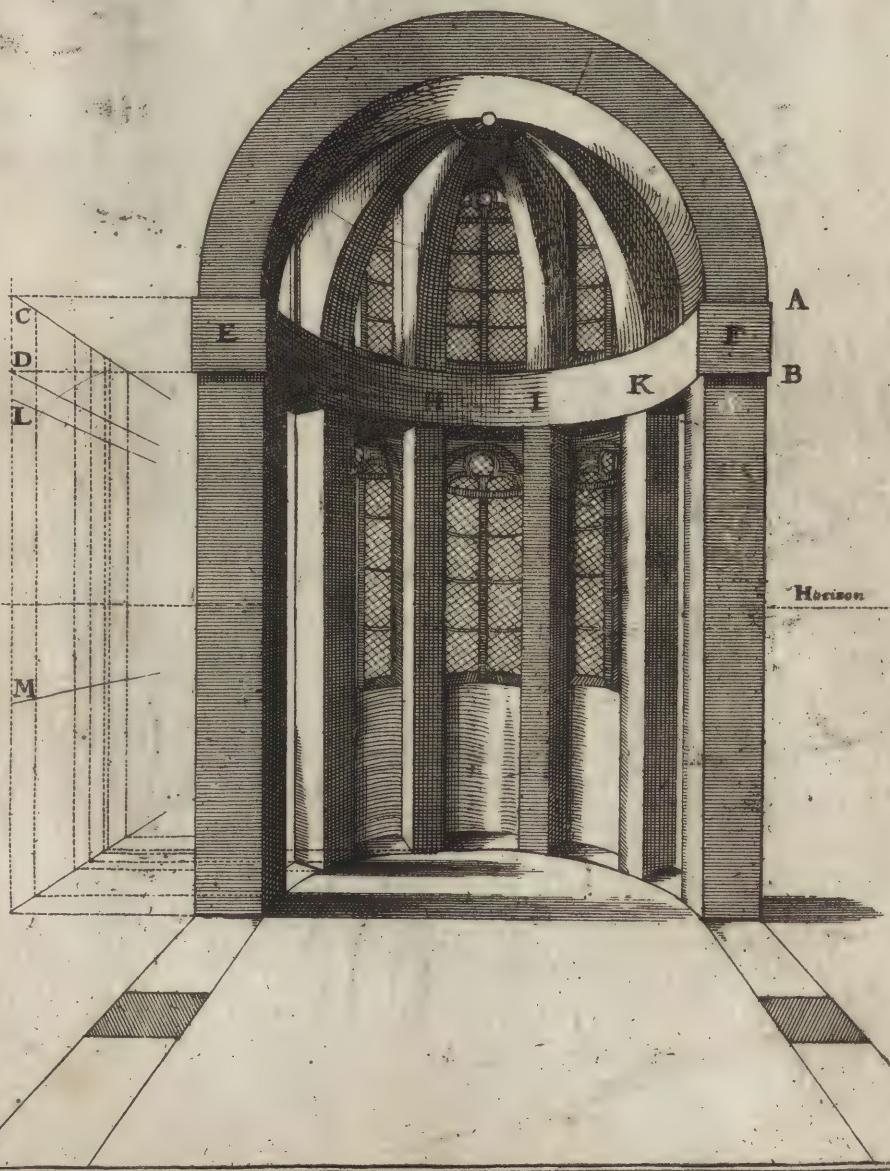


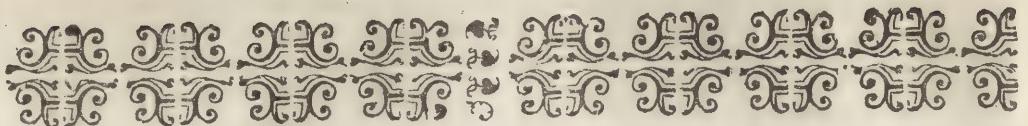
*A VAULT in form of a Shell,
in Perspective.*

THIS Figure may serve for the *Hollow* of a Church or Grotto, a *Nich*, or the like : The Elevation is perform'd after the manner already directed.

As to the Plat-Band, or Border, A B, which might serve for a Cornish, its Diminution is to be taken on the Line of Elevation in C D, and transfer'd thence to the Pilasters.

For the Vault, take the first Arch E F, as before taught, and in the middle of the Inside describe a Semi-circle O, to which draw curve Lines springing from off the Pilasters, and you will have the Ribs or Reins of the Vault, as in G H I K. The Heights of the Windows must be taken on the Line of Elevation between L and M. For the rest, see the Figure.



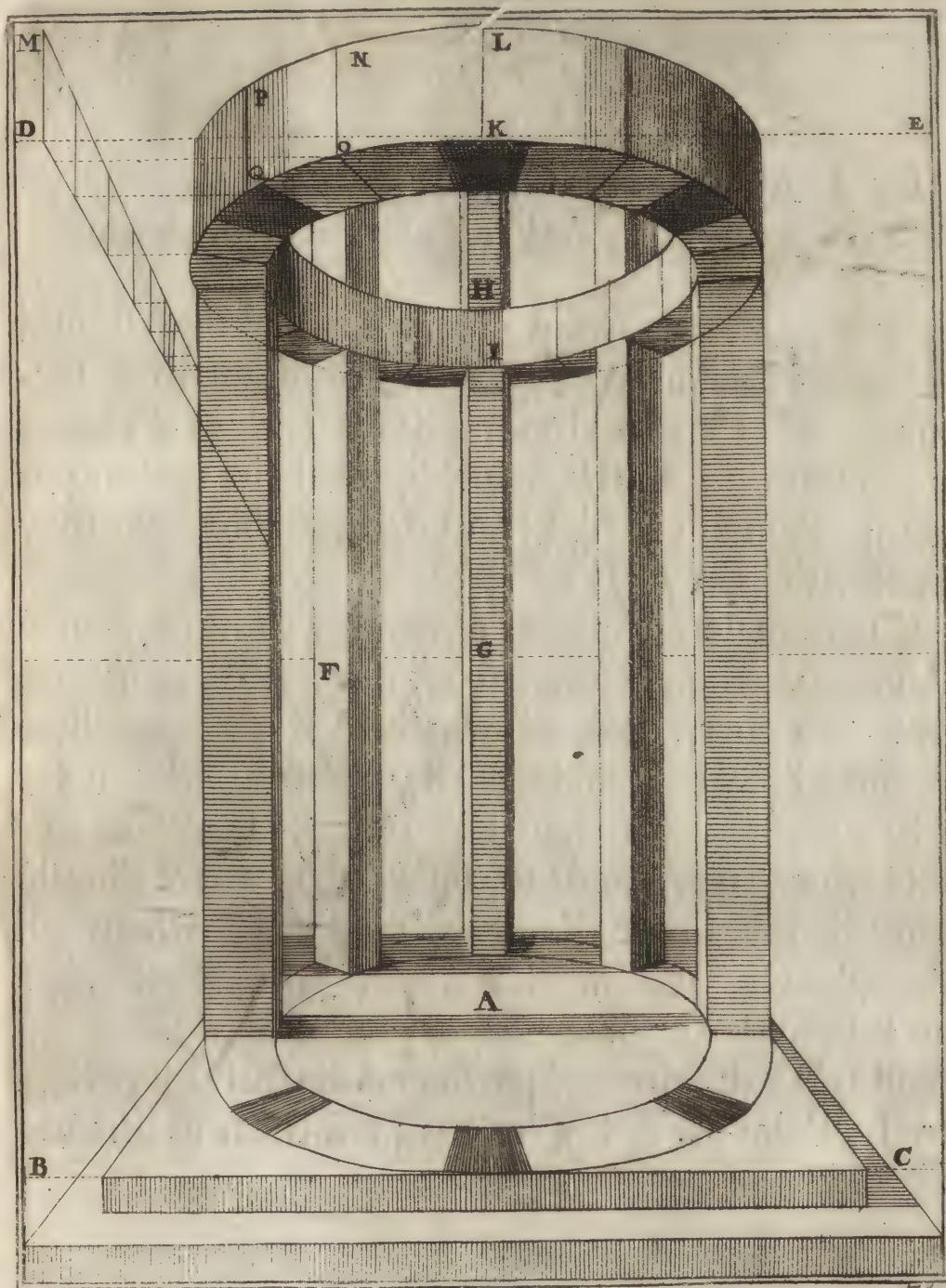


Open DOMES, or VAULTS, *in Perspective.*

HAVING made the Plan of a double Circle according to *Pag. 29.* and marked the Places and Number of Pilasters between the two Lines, all of them tending to the Center A, set off the Height intended from the Ground to the Cavity of the Dome, as the Line DE, which is to serve for a Base Line, upon which the Measures already laid down on BC are to be placed; then from the same Point of Sight G make another Plan at the Top, like that at Bottom, all the Places of the Pilasters tending towards the Centre H. To form the Pilasters all required is to draw Lines from the Places opposite to each other, which will thus give the Breadth and Thickness. I have drawn no Lines for the three Fore Pilasters, both to shew those behind, and to Instance that there must be both at Top and Bottom.

To give the Thickness of the Rotundo from I to H, and from K to L, set the intended Height on the Line of Elevation DM, tending to the Horizon in the Point F; and from the several Points whereof the Circle consists, to draw Parallels to the Line D, whereon are to be erected Perpendiculars, as DM, which are to be transfer'd thence, with the Compasses, to the Perpendiculars raised from the same Points KL, NO, PQ; and so of the rest.

If instead of a Round you require a Square, or Polygon, the same Method is to be observed.





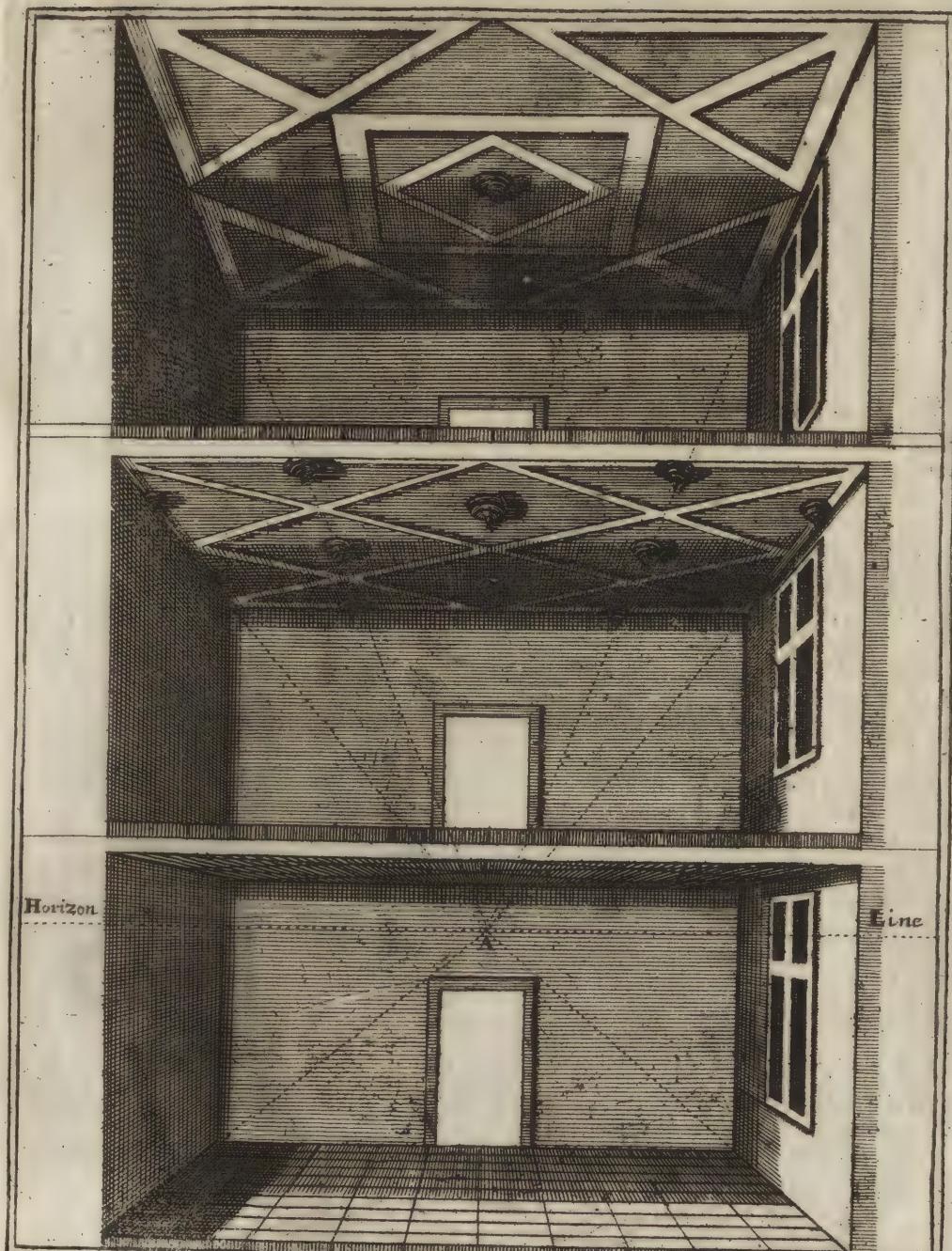
That a Number of OBJECTS, and Plurality of STORIES, only admit of one Point of Sight.

IT has already been observ'd, that one should never use above one Point of Sight in a Picture, and that the Ignorance of certain Painters is published to all the World, by their making as many Points of Sight, and Horizons, as they make Lines.

'Tis not long since I remember to have seen a Painting, wherein there were several Rooms one over another, each of which had two or three Points of Sight ; and yet the Painter took it for Miracle. The present Figure may serve to correct this Error, and to shew, that there should only be one single Point of Sight, to which all the Objects, and all the Rooms, tho' there were an hundred over or a-side of one another, are to tend : As the three Apartments do all here tend to the Point A. The rest is performed as already directed.

PRACTICAL

76



70



To put CHIMNEYS in Perspective.

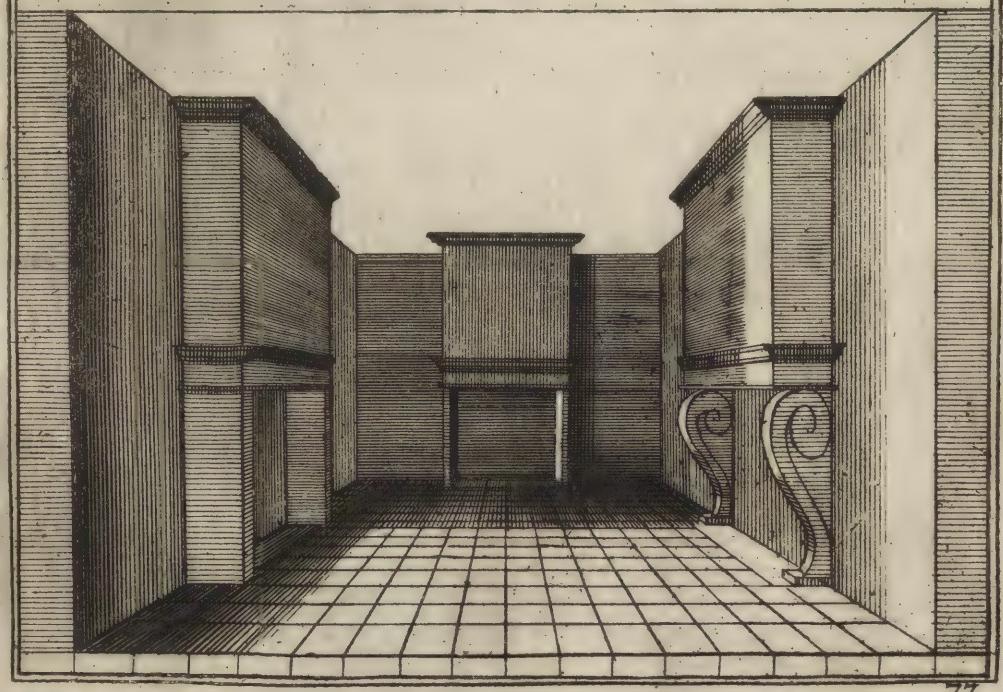
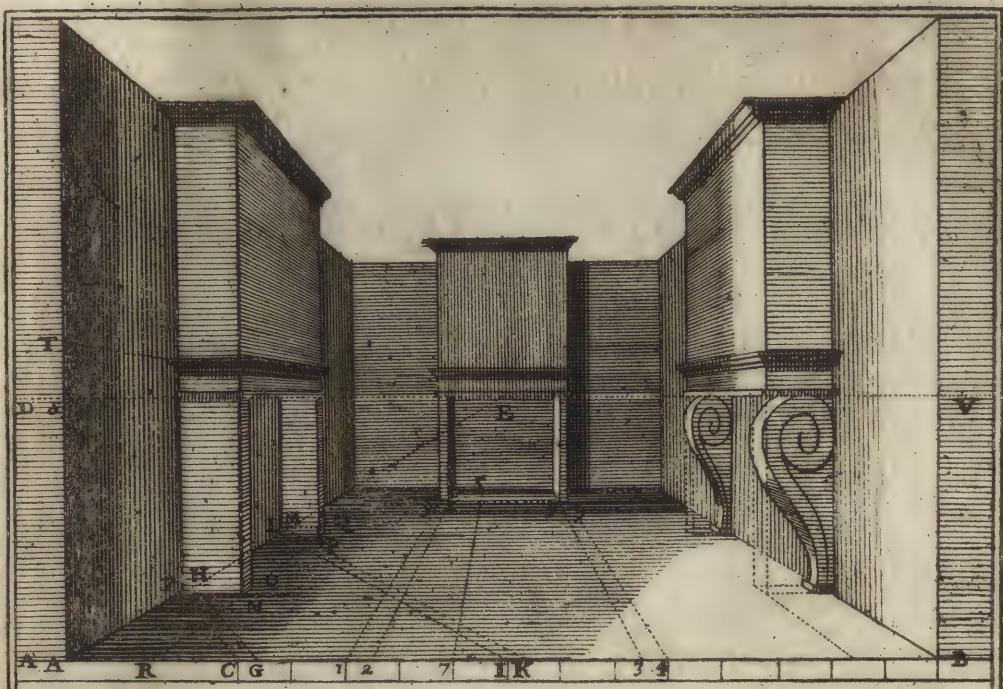
THE Measures are to be taken on the Base Line A B, which, to that End, must be divided into equal Parts. The Divisions may be accounted any Thing at Pleasure. The present is divided into eighteen, which we call Feet.

To make a Chimney, or Fire Place, in a Wall, A, three Foot within the Room, take three Divisions as A, R, C, and from the Point C draw a Line to the Point of Distance D, which cutting the Ray A E in the Point F, gives a Depth of three Foot. Proceed to set the Thickness of the Jaumb from C, for Instance, to G; then drawing a Line from G to D, it will give the Thickness of the Jaumb in the Point F. Then set the Breadth of the Chimney from G to I, four Foot and a half; and half a Foot, *viz.* from I to K, for the Thickness of the Jaumb; then drawing Lines from I and K to the Point of Distance D, you will have their Measures on the Ray A E, in the Points L M: And from the four Points F H L M draw little Parallels to the Base Line, as F N, H O, L P, M Q. For the Breadth of the Jaumbs take a Foot and a half, *viz.* A R, and the Ray R E will cut the little Parallels in the Points N O P Q; from which, and from F L raise Perpendiculars. For the Height of the Mantle Tree, take five Foot on the Base Line, and set them off on the Corner of the Wall from A to S; and from S to T set off for the Cornish. All the rest is obvious from the Figure.

The other Chimney opposite to the first is done after the same Manner: For thus the Jaumbs are in all Cases to be managed. And of the Jaumbs may occasionally be made Columns, Termins, or, as we have here done, Consoles.

To find the Hole, or Aperture of the Chimney, with the Depth of the Jaumbs, draw a Line from 7 to the Point of Sight, cutting the Line of Depth in the Point 5, which will be a Foot and a half; then, from the Point of Distance V, draw a Diagonal through 5, cutting the Ray 2 E in the Point 6; and from this Point draw a Parallel, cutting the four Rays 1, 2, 3, 4 in the Points 9, 6, 9, 9: From which Perpendiculars are to be raised, and the rest conducted, as above.

The second Figure represents what we have been speaking of, free and unembarrass'd with Lines.





STAIRS *in Perspective.*

THERE is nothing gives a Perspective so much Grace, or deceives the Eye so easily, as a Number of Returns and Breaks; by Reason these introduce a Number of different Lights and Shadows, which give the Objects such a Force, that they seemed to project or stand out from the Ground. Now Stairs have this Advantage, that what Way soever you place them, they have always a Variety of Shades, and of Consequence are agreeable to the Sight. We shall add a few as Specimens.

If you make use of Squares, there will be the less Difficulty, all required being to raise Perpendiculars of as many Squares as you would have Steps; then to set the Line of Elevation, divided into any Number of Parts, on the first Square, and from the Divisions to draw Lines to the Point of Sight, which will intersect the Perpendiculars in the Places where the Steps are to be.

'Tis desired, for Instance, to construct a Stair Case of eight Steps, the last of which to be the Breadth of three of the rest; take the Number of Squares of the Plan, beginning at B, and proceeding 1, 2, 3, 4, 5, 6, 7, 8, and allowing three for the last marked 11, from all these Angles erect Perpendiculars, to be cut according to the Divisions on the Line of Elevation BD, in Manner following.

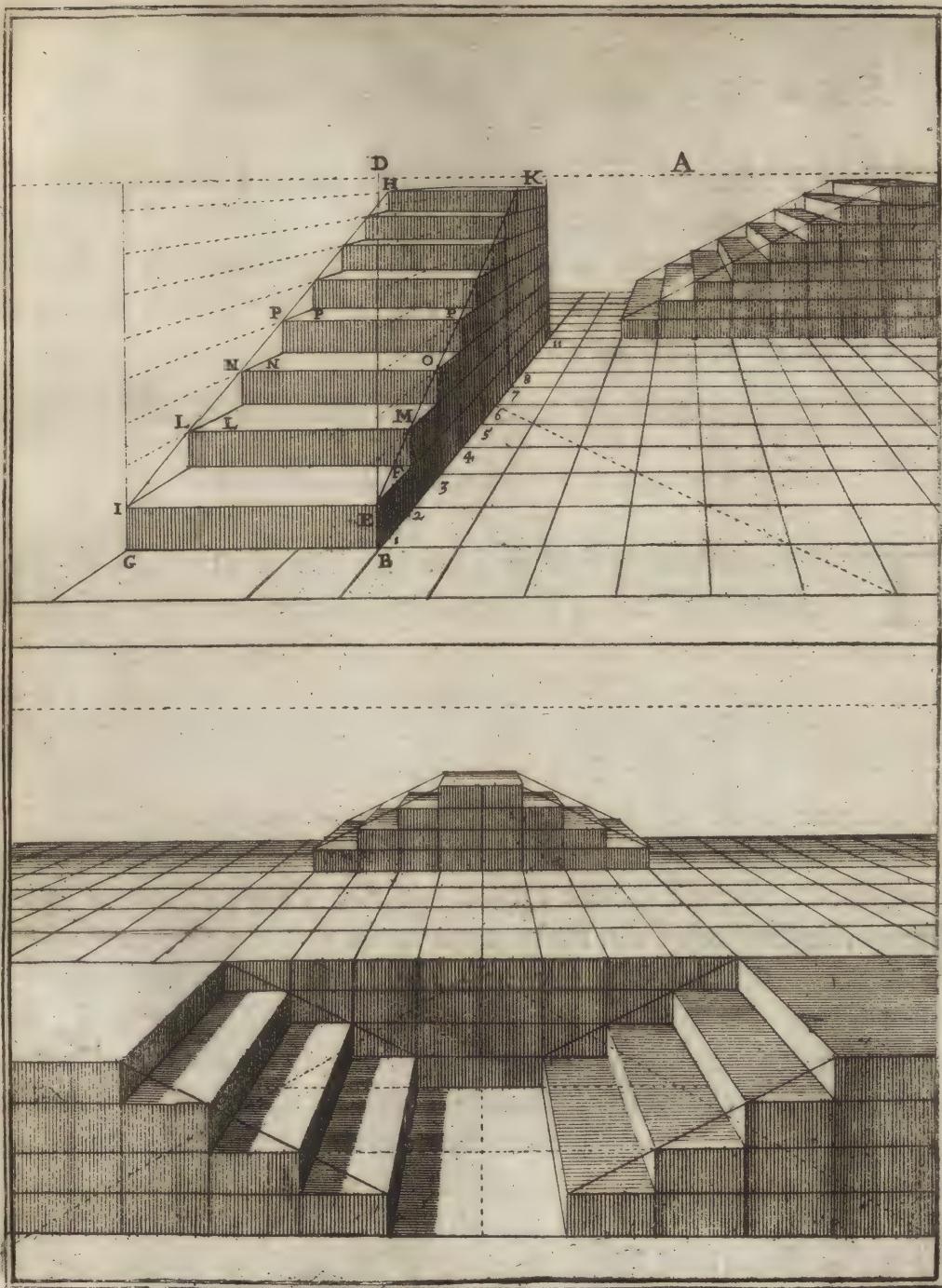
The first Division, which, supposing the Square to be a Foot, is four Inches high, will cut the first Perpendicular, and must be continued to 2, which makes the Top of the Step; and so of the rest. The Steps you may make as long as you please, by supposing the Square a Foot: Accordingly these here, taking three Divisions, are three Feet. Perpendiculars should likewise be raised, as in this Instance, on the Side B: But that Trouble may be saved, by taking the Height of the last Step H, and that of the first I, and drawing the Line HI, raising the Angles on the Side I, as EK does on the Side B; for this done, you need only to draw Parallels to the Base Line from all the Steps and Divisions of the Side B, till they intersect the Line HI in LM NOP Q, &c.

One might likewise do without making Squares; for laying all the Measures on the Base Line, and drawing Lines from them to the Point of Distance, the same Measures would be had on the Line AB.

The other Figures we are silent upon, thus much being sufficient for the understanding and executing them all.

PRACTICAL

78



X

78



STAIRS open or perforated underneath.

TH E Method of managing these Stairs is the same with that already describ'd.

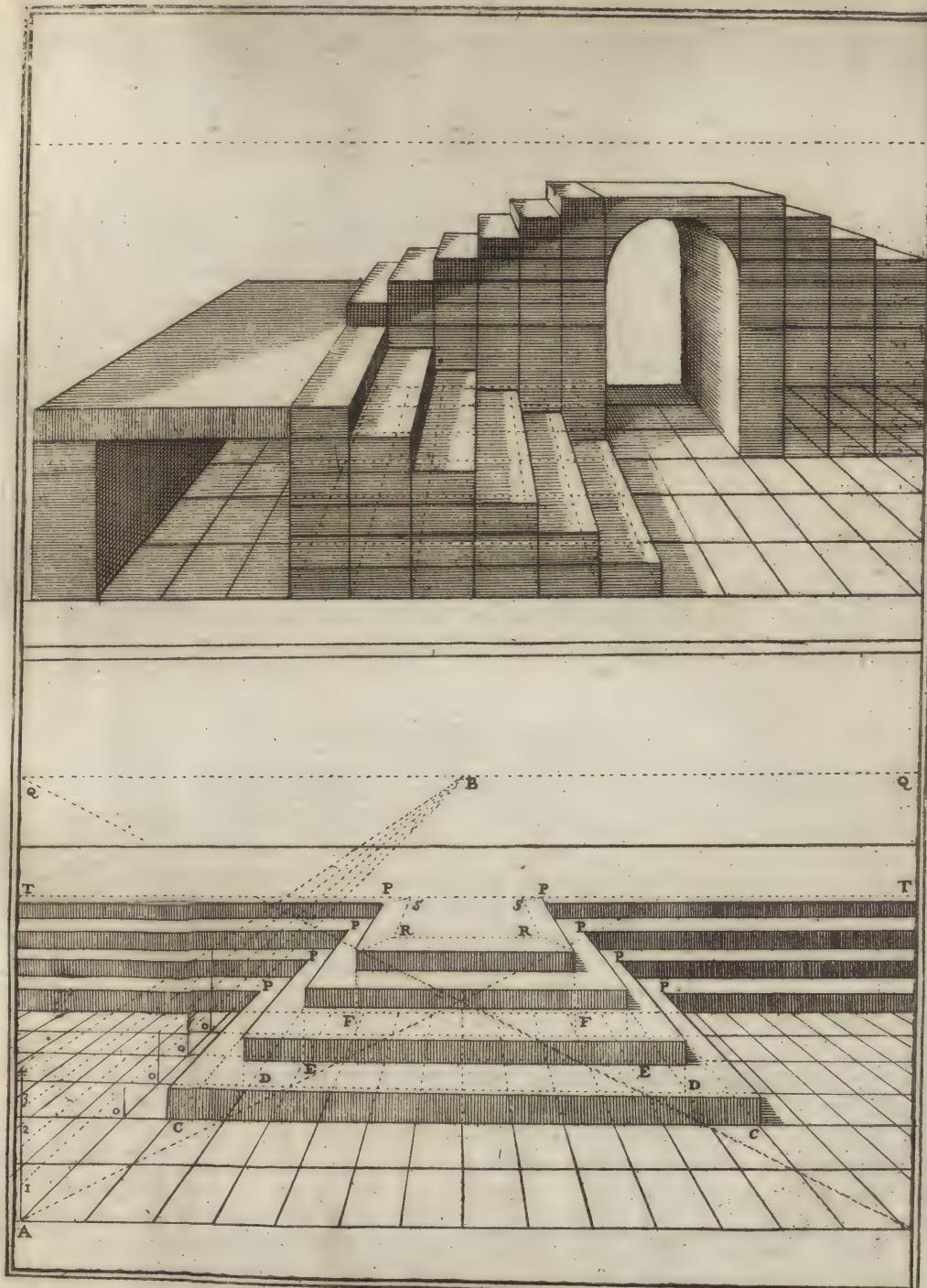
As to the Aperture, a bare Sight of the Figure is sufficient to shew how it is to be put in Perspective. These two may give occasion to the inventing many others.



STAIRS viewed in Front.

THIS Method is founded on the Use of the Line of Elevation: As many Perpendiculars are here to be rais'd from the Angles of the Squares of the Plan, as there are requir'd Steps, *ex. gr.* CDEF; and from the same Angles Parallels are to be drawn to the Line of Elevation A, the Intersections whereof give the Points OOOO, from which Perpendiculars are to be rais'd till they cut the occult Rays of the Divisions of the Line of Elevation. These Measures are to be taken in your Compasses, and set off on the Perpendiculars rais'd from the Angles of the Plan, each in its Order; the first for the first Step, the second for the second, &c.

To find the Returns P P, &c. from the same Angles P, &c. Lines are to be drawn to the Point of Distance Q, and notice taken where they cut the Line of the Plan, or the Bottom of the Step; for Instance, over the fourth Step is the Plan of the fifth: Now to find its Return P, from the Point P draw a Line to Q, and the Point S, wherein it intersects the Parallel RR, will be the Line of Return ST; and so of the rest.





STAIRS that shew four Sides.

THESE are various Manners of ordering such Stairs; two of the easiest of them follow. First, take the Length of the first Step, and set the Number of Steps required upon the same; as on the Line A B are here set Points, C C C C, for four Steps. From these Points draw Rays to the Point of Sight D, which Rays are to be cut by the Diagonals A F and B E in the Points I I, from which Perpendiculars are to be rais'd, and Parallels drawn to the Line of Elevation G, which give the Points H, to be rais'd as H K.

On this Line of Elevation G as many equal Parts must be mark'd as there are Steps desired, ex. gr. four, here marked 1, 2, 3, 4. These are all to be drawn to the Point D, to cut the Perpendiculars H K, and give each its proper Height.

These Measures must be taken in the Compasses, and transfer'd one after another, beginning with the first G, which is to be set on the first Perpendicular on the Angle A, viz. A L; then a Parallel to be drawn to the other side B, (tho' here we only give half of it, to have room for the Plan in the other.) For the second Stair the second Measure H 2 is to be taken, and set off on the second Perpendicular I; next a Parallel is to be drawn as before; and so of the rest.

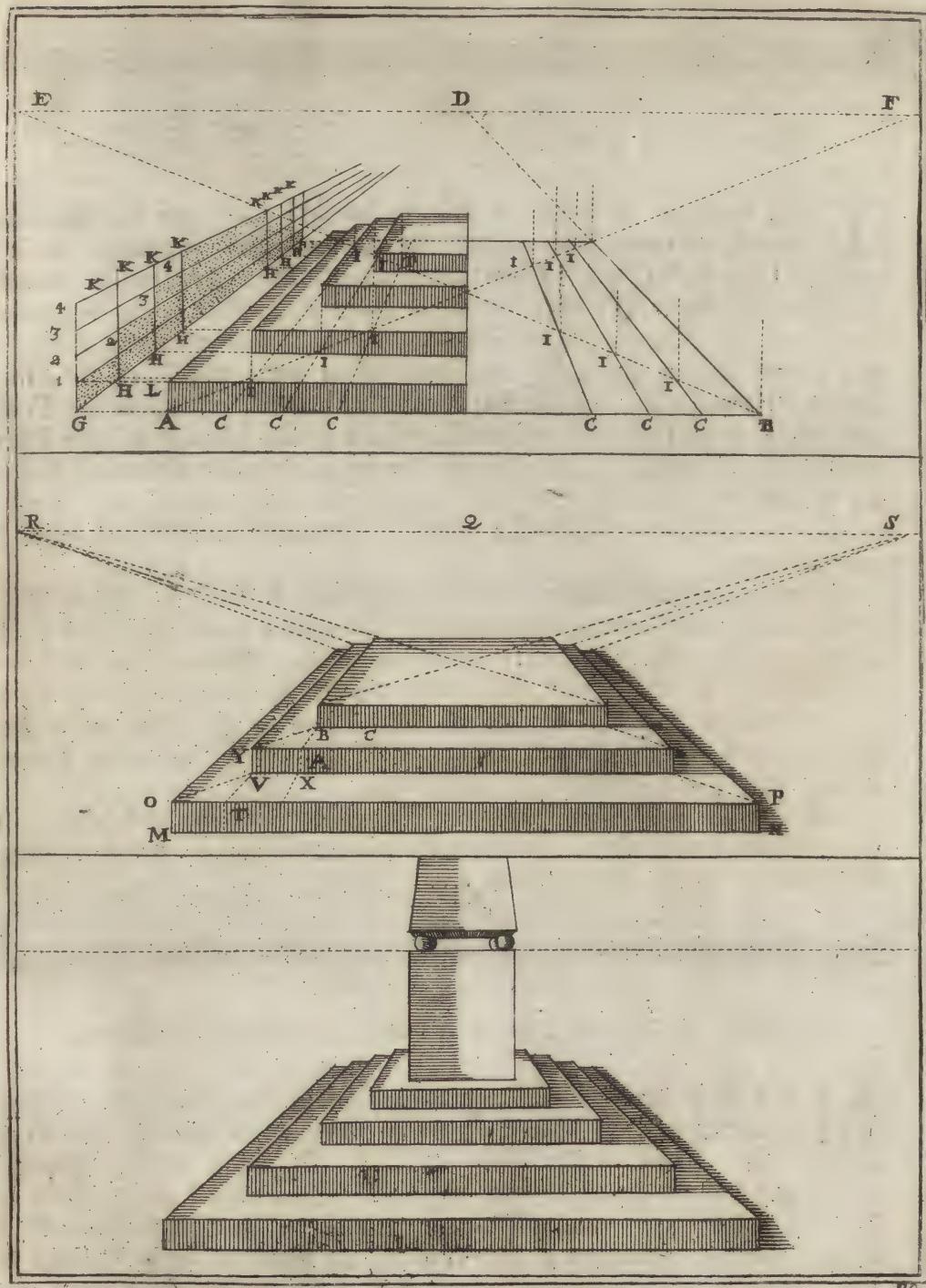
Another Manner.

THE Side M N being given, make a Parallel O P over the same, for the Thickness or Height of the first Step: From the two Points O P draw two Rays to the Point of Sight Q, and again others to the Points of Distance R S; which last will give a Square after the usual Way, and form the first Step. For the second, set the intended Breadth on the Line O P, ex gr. O T, and from T draw a Line to the Point of Sight Q; which Line or Ray T Q will cut the Diagonal O in the Point V, the Place where the second Step must be rais'd. The Height of this second Degree must be half of V X, as M O is half of O T. The Point Y thus gain'd, a Parallel must be drawn through it as far as the Diagonal of the other side drawn from the Corner P; then from Y and Z draw Lines to the Points of Sight and Distance, to form the Square, as for the first Stair. For the third, set the Measure V X on the Line Y Z, extending, ex. gr. from Y to A; and from the Point A draw a Line to the Point of Sight Q, which intersecting the Diagonal of the Point Y, will give the Point B for the third Stair. Its Height will be half of B C, which is always that of O T in Perspective. The rest the same as in the first and second.

The third Figure shews these Stairs free of all the Confusion of Lines and Letters.

PRACTICAL

80



80



STAIRS view'd side-wise in Perspective.

TH E Number of Stairs is first to be laid down on the Base-Line, that is, so many Points are to be made at equal Distance; as in the present Case A B C are. From these Points Lines are to be drawn to the Point of Sight D; then from the Point A another is to be drawn to the Point of Distance E; which Diagonal AE will give the Plan, and the Place of the Stairs, by its Intersection with the Rays B C in the Points I; and by its Intersection with the Ray F, which is the Foot of the Wall, it will give the Point G, which is the Middle of the Plan of the Stairs. From G a Line is to be drawn to the other Point of Distance H, which gives the Angle of the last Stair in the Point K, and the Place of all the rest in the Points I I. Lastly, from all the Points I erect Perpendiculars.

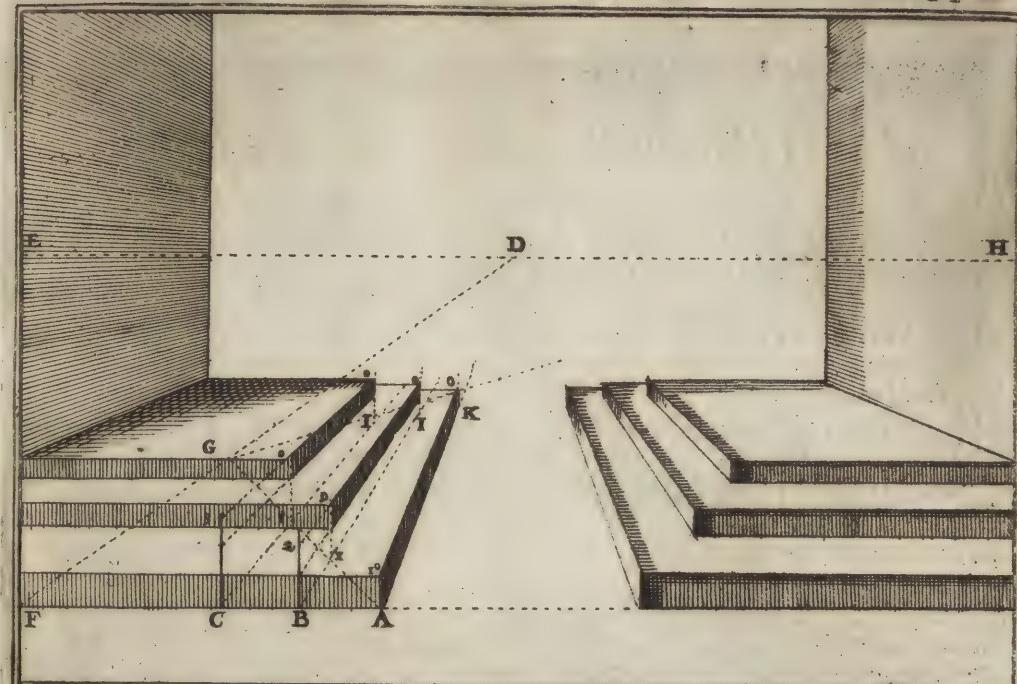
Now to give the Heights; from the Points A B C on the Base-Line erect little Lines, serving for a Line of Elevation; on these lay the Heights according to their Number: A, for Instance, which is the first, will only have 1; B, the second, will have 2; and C, the third, will have 3. From all these Points 1, 2, and 3, draw Lines to the Point of Sight D, and you will cut the Perpendiculars rais'd from the Plan in the Points O, which will give the Height of each Step.

That on the other side shews the Thing free of Points and Lines. The same Method may serve for divers Purposes; as for an Altar, a Throne, the Front of a Church, a Gate, &c.

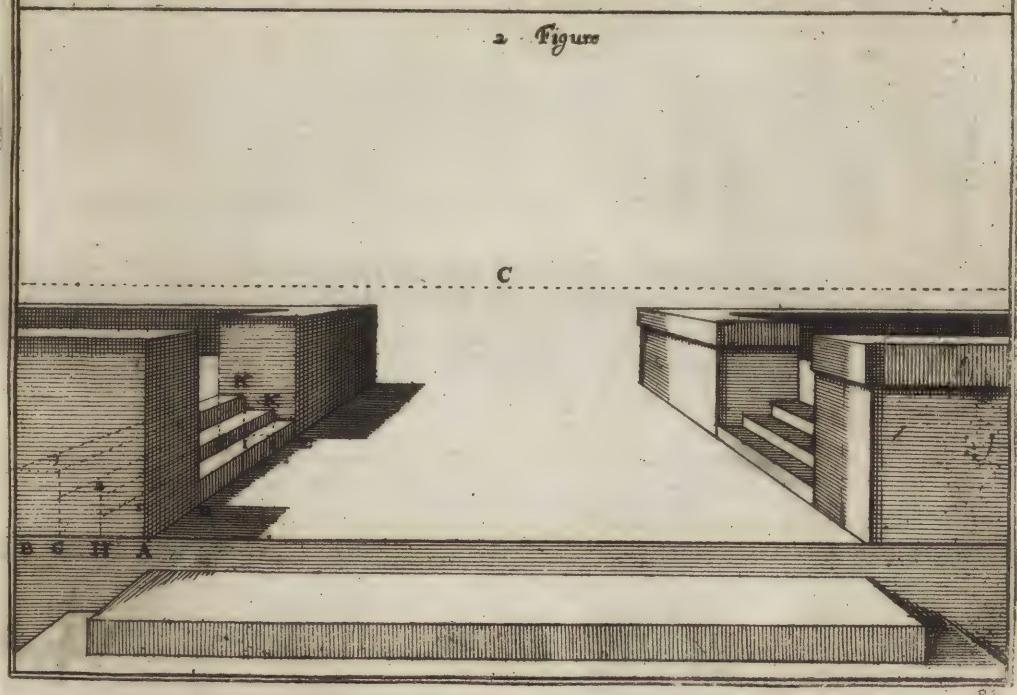


STAIRS in a Wall in Perspective.

MAKE as many Divisions at the End of the Base-Line as you intend Stairs, as in this Case, three between A and B, and from A and B draw Lines to the Point of Sight C; then, having determin'd the Space the Stairs are to take up, as D E, a Parallel to the Base-Line, E F, must be drawn, which in the Points I I will receive the Intersections of Lines drawn from the Points G H to the Point of Sight C; and from the same Points I I Perpendiculars, I K, I K, are to be erected, to receive the Heights of the Stairs, by drawing Points, 1, 2, 3, to the Point of Sight C, as appears from the Figure.



Figure



A STAIR-CASE with Landing-Places in Perspective.

DO but recollect the preceding Methods, and you'll find it exceeding easy to construct such Stair-cases: However, to save the Trouble of too irksom a Retrospect, we shall explain the whole here.

By reason Stair-cases of this Figure usually run over a Space equal to twice their Width, to raise one of them in Perspective, the Horizon must first be disposed at pleasure; then a Square to be made according to the common Rules, and this to be doubled, as directed in *Pag. 16*; then divided by an unequal Number of Squares, that the Wall, which is suppos'd in the Middle, may be the Measure of a Square.

In this Figure each Square has nine Sides, or Squares, on either Hand, which being doubled, give eighteen; of these, four being left at each End for the Landing-places, remains ten Squares, or Stairs, each whereof we suppose equal to a Foot every way.

Having left four Squares, beginning at the Point A, which serves in lieu of a Wall, erect a Perpendicular B pretty high, then a second C, and a third D; and so of the other Angles of the Squares, to the Number of ten. This done on one side, the same must be repeated on the other; and such Perpendiculars will give the Depths or Breadths of the Steps.

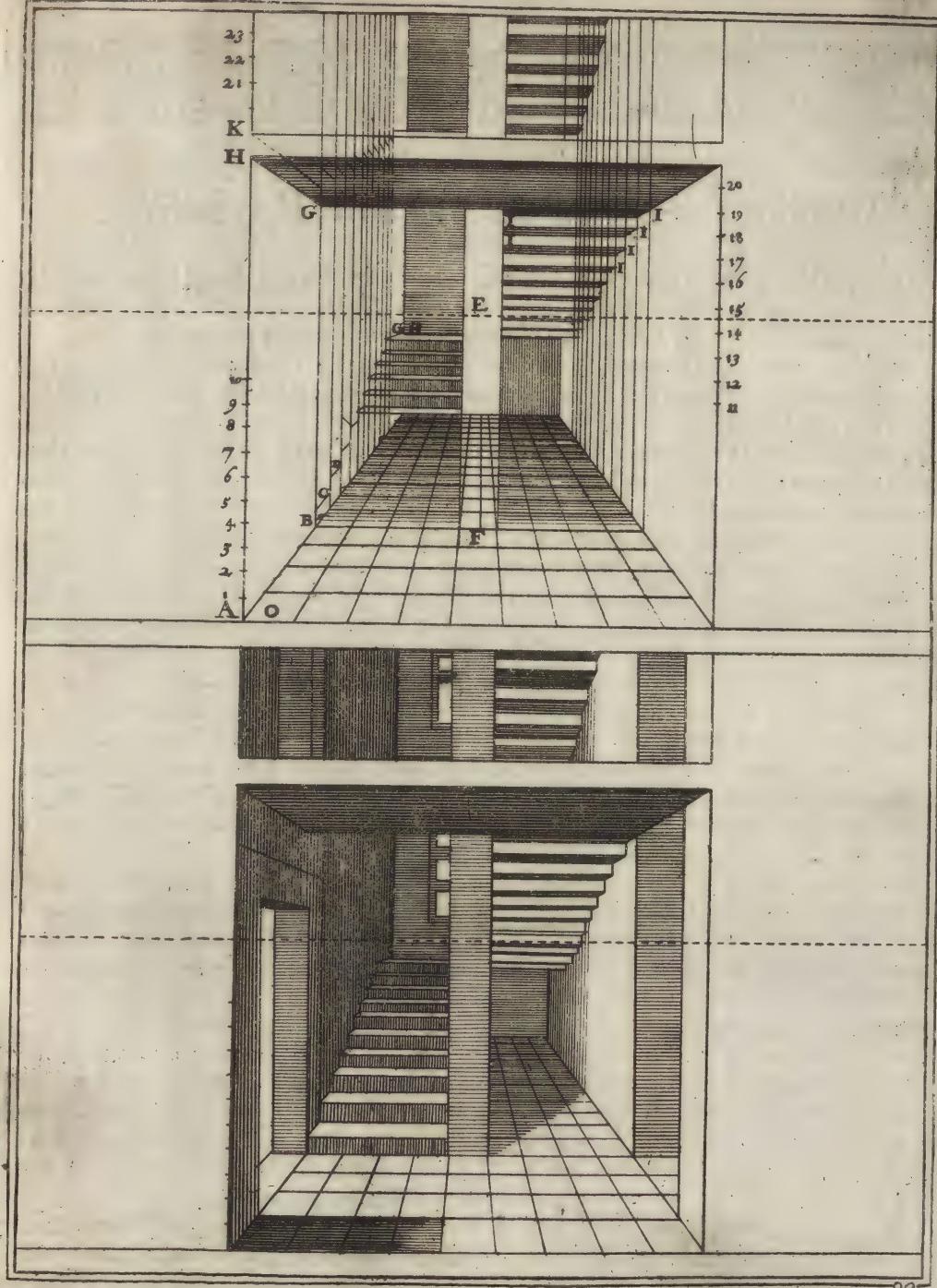
For the Heights, if they be a Foot broad, they must be half a Foot high, or half the little Square A O; which Height being taken in your Compasses, set it on the first Angle, which is to serve for a Line of Elevation, beginning at the Bottom, or the Point A, and making as many Divisions thereon as you intend Stairs, *viz.* ten, from the Bottom to the first Landing-place; where you begin to mount up the opposite Side, and the Series of Numbers is continued to twenty-three.

From all these twenty-three Points, Lines are to be drawn to the Point of Sight E, and care taken to cut the Perpendiculars in their Order; that is, having laid your Ruler from the first Point to the Point of Sight, cross the first Perpendicular B to G with a little Stroke, for the first Step. For the second Step, from the second Point draw a Line, crossing the second Perpendicular C to D. And so of all the rest on both sides.

From the Angles of all these little Strokes between the Perpendiculars draw Parallels to the Horizon, as far as the Wall F erected in the Middle; such are the Lines I II I, which I have only added on one side, to avoid Confusion: 'Tis these Parallels alone that form the Stairs. All the other Lines hitherto drawn should be occult, and not to be seen when the Figure is finished.

The Landing-places should contain what the last Perpendiculars come short of the Wall, as from G to H. Their Height, or Thickness, H K, is half a Foot, the same as that of a Stair.

The lower Figure is the same with the upper, only that the one has the Apparatus of Lines, &c. necessary for the Performance, which the other is without.





Winding or Spiral STAIRS in Perspective.

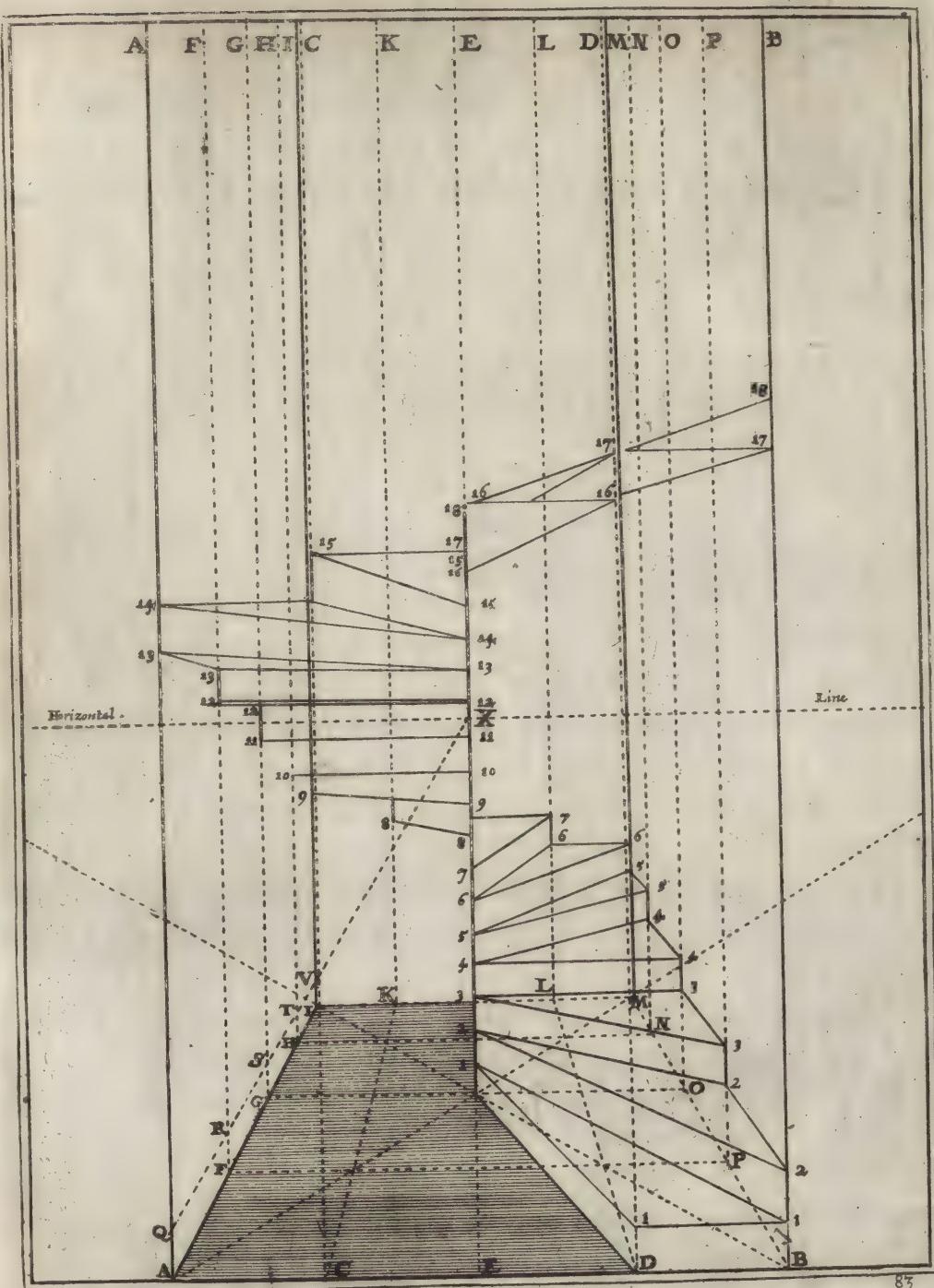
ON E Side of the Flight, or Ascent, is to be set on the Base Line, and divided into as many Parts as you require Stairs: Suppose, for Instance, A B the Side of the Stair Case, and sixteen Steps required in the whole Circuit of the Square; each Side, in this Case, will contain four; consequently A B being divided into four, a Square is to be formed thereof, divided into sixteen, according to the usual Rules.

From all these Divisions, which part the Lines of each Side into four, Perpendiculars must be raised to give the Bounds of the Stairs. Suppose then the Perpendiculars A A, B B, C C, D D, E E; (this E E stands for three, by Reason the Point is in the Middle, and serves as a Newel, or common Centre of them all;) on the first Perpendicular A, which is to serve for a Line of Elevation, the Height of a Stair Q A must be set, and from the Point Q a Line be drawn to the Point of Sight X, which by its Intersections with the Perpendiculars Q R S T V, gives the Dimensions of all the Stairs. Thus A Q is the Height of the first, F R of the second, G S of the third, H T of the fourth, and I V of the fifth. This last is the Height of all those at the Bottom, as A Q is of those in the Front.

Since G S is the Measure of the third, which is that in the Middle of the Side, it must likewise be the Measure of the Centre, and of the Newel of the Flight: For this Reason, having taken the Measure G S in your Compasses, set it off in the Centre of the Square as many Times as you would have Stairs in the Flight; ex. gr. eighteen Times for eighteen Stairs.

All Things thus disposed, the rest is easy. For the first Step you are to take the Division A Q, and set it off upon the Perpendicular D in the Point I, and from I to draw a Parallel as far as the other Perpendicular B; then from the two Points I I draw Lines to the third I in the Centre of the Square: These three I I I will form the first Stair. For the second, since its Angle reaches to the Perpendicular B, which is on the Fore-side, it must have the same Measure A Q, which will be 1, 2; then from the Point 2 a Line to be drawn to the Point of Sight X, cutting the Perpendicular P in the Point 2; from which Points 2 and 2 Lines are to be drawn to the 2 in the Centre: Thus will you have formed the second Stair. For the third, since it is found on the Perpendicular P, the Measure F R must be taken for its Height; and the same Process observed as in the former.

If you would have them round withal, the Square must be reduced to a Circle; according to the preceding Rules: And for the rest, the same Method will serve for both.





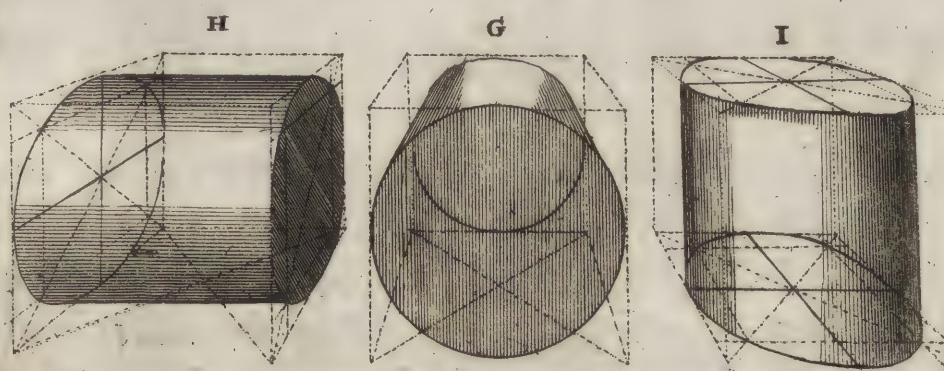
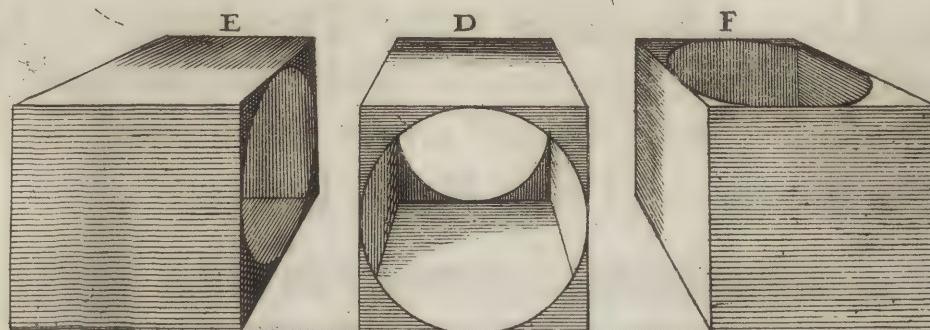
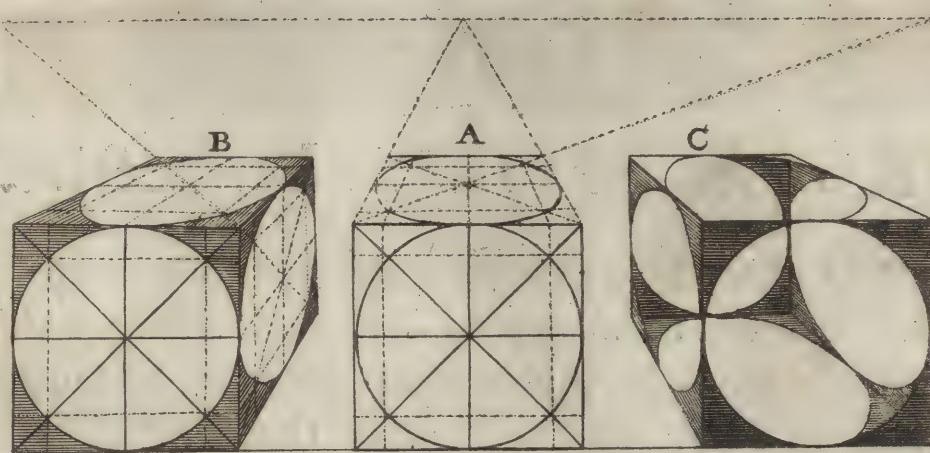
SQUARES with Circles therein, in Perspective.

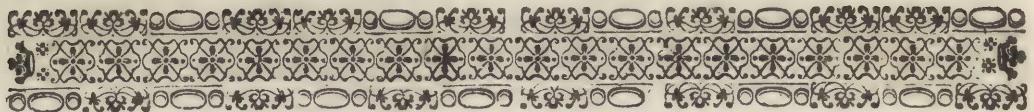
TH E Method is the same with that deliver'd among the Planes. The Circle, for Instance, is to be divided into eight Parts, as in Figure A, wherein the Circle of the Front of the Cube gives the Diminution of that a-Top; and that in the Front, with that a-Top, the Diminutions of all the other Sides; as in Figure B, where the Circle is diminished on three Sides; and in the other C, where it is diminished on all three Sides of the Cube.

The three Figures D E F are perforated each on two Sides, according to the Plan of the Circle A: Thus the Cube D is pierced thro' its Fore-side; and thro' that Perforation the Bottom is seen perforated: Thus also E is perforated on the Sides; and F thro' the Top and Bottom, tho' the latter Perforation be not distinguishable, by Reason the Matter is not supposed transparent.

The three Figures underneath represent the Pieces cut out of each Cube; G, for Instance, out of the Cube D, H out of E, and I out of F.

Upon the whole, the Method of disposing square Figures in Circles appears very easy; nor can the Reader find any Difficulty in placing Columns under any Disposition at all. The Reason why we have given none before is, that we chose to render the taking of Elevations as easy to conceive, and the Practice as little embarrass'd as possible. Thus much may serve for the Beginning of Columns; how to carry on and finish them shall be shewn hereafter.





ROUND STAIRS *in Perspective.*

TO raise these three round Stairs or Steps, in a front View, make a Plan of three Circles within each other, after the Manner already directed in *Pag.* 28. and from the several Points that form the Circle draw Lines parallel to the Base, as far as the Ray A, which is the Foot of the Line of Elevation A B : This gives the Elevations, which are to be taken thence with the Compasses, and set off on Perpendiculars raised from the several Points of the Plan.



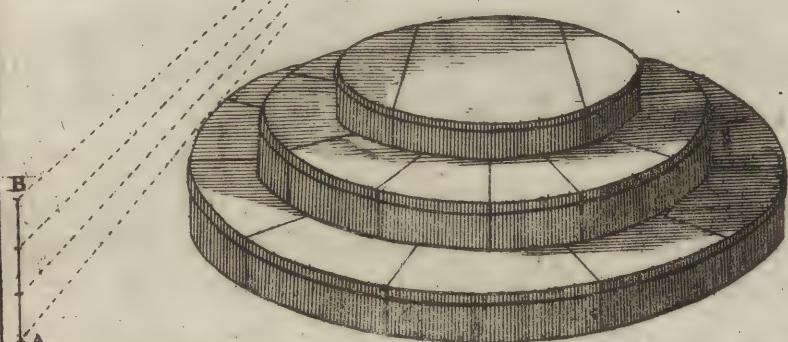
ROUND STEPS *view'd Side-wise.*

TH E Rules for Objects viewed by the Sides we have often observed are the same with those for Objects in Front : However, to shew we are not always obliged to observe the Division of the Circle into sixteen, these of the Side-view we have divided into eight. For the rest, 'tis the same as in the preceding Cases. The Line of Elevation is CD, drawn to the Point of Sight E.

1. fig.

Horizon

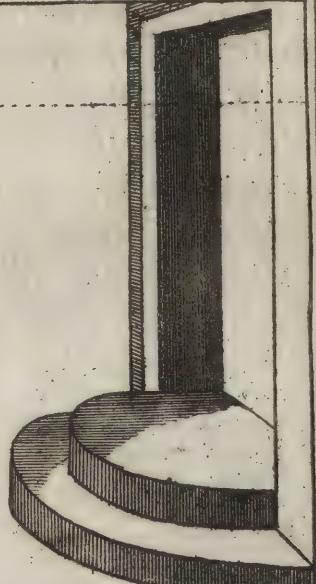
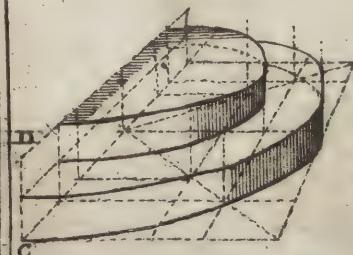
E



2. fig.

Horizon

E



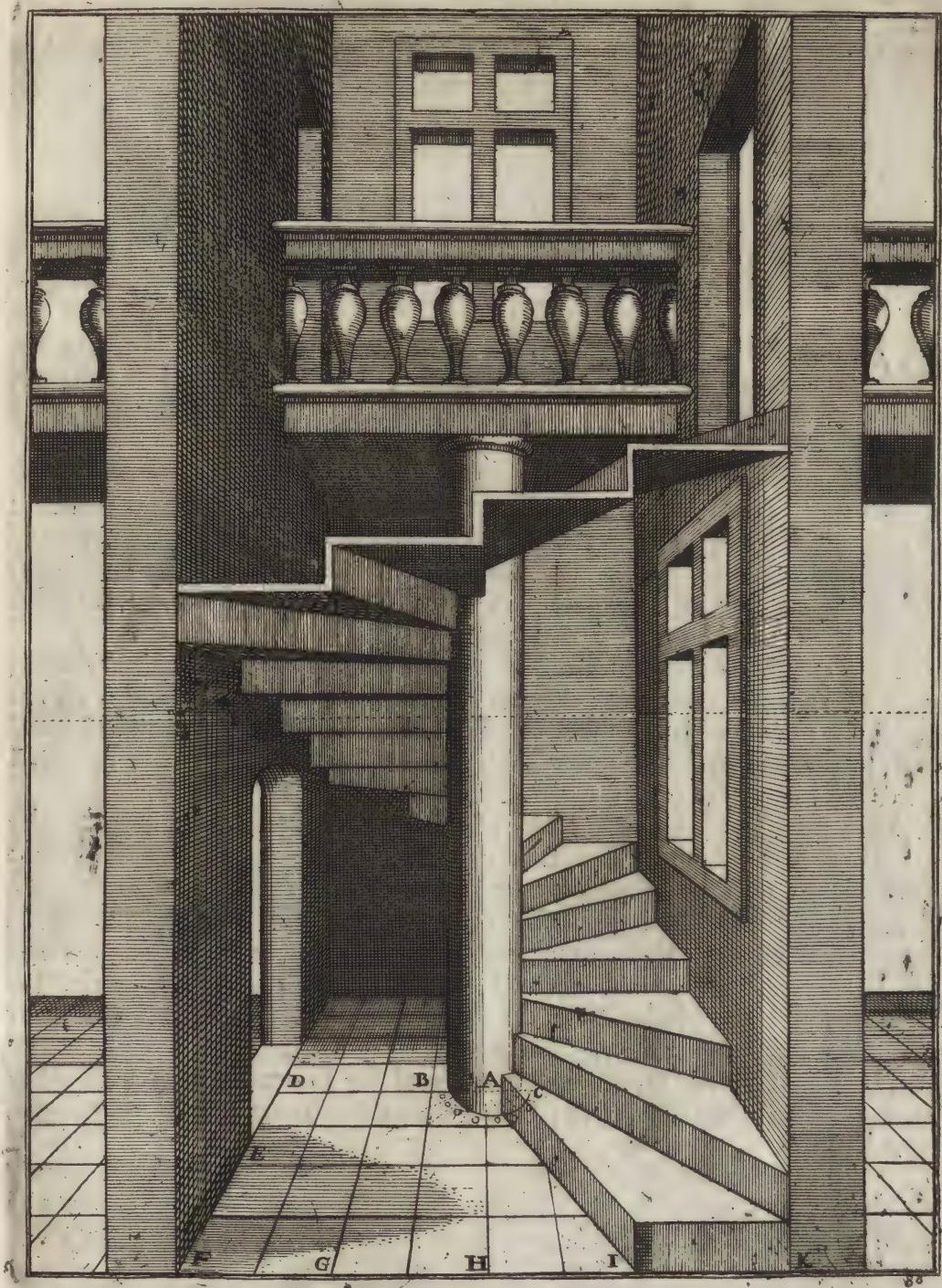


WINDING-STAIRS.

THIS Figure is the same with the preceding one; which was not shaded, that the Method of the Operation might be the more conspicuous: For the same Reason the Newel of the Stair-case was reserved for this Figure. It is formed by assuming the Point A as a Center, and thence describing a Circle; or rather a Semi-circle, as BC, by Reason only half of it is to be seen. To the Center of this Semi-circle Lines must be drawn from all the Divisions of the Square of the first Plan, as DEF GHIK, which will cut the Arch BC into eight Parts; and from the Intersections OO, &c. Perpendiculars are to be raised; taking Care they cut precisely in the Points, where the Steps are placed; the Step I, for Instance, to be cut by the Perpendicular raised from its Point in the Semi-circle, as in A; the second Step to be cut by the Perpendicular raised from the Point which K gives in the Semi-circle: And so of the rest.

The Doors, Windows, &c. in the Figure, are all constructed according to the Rules already laid down.





Z



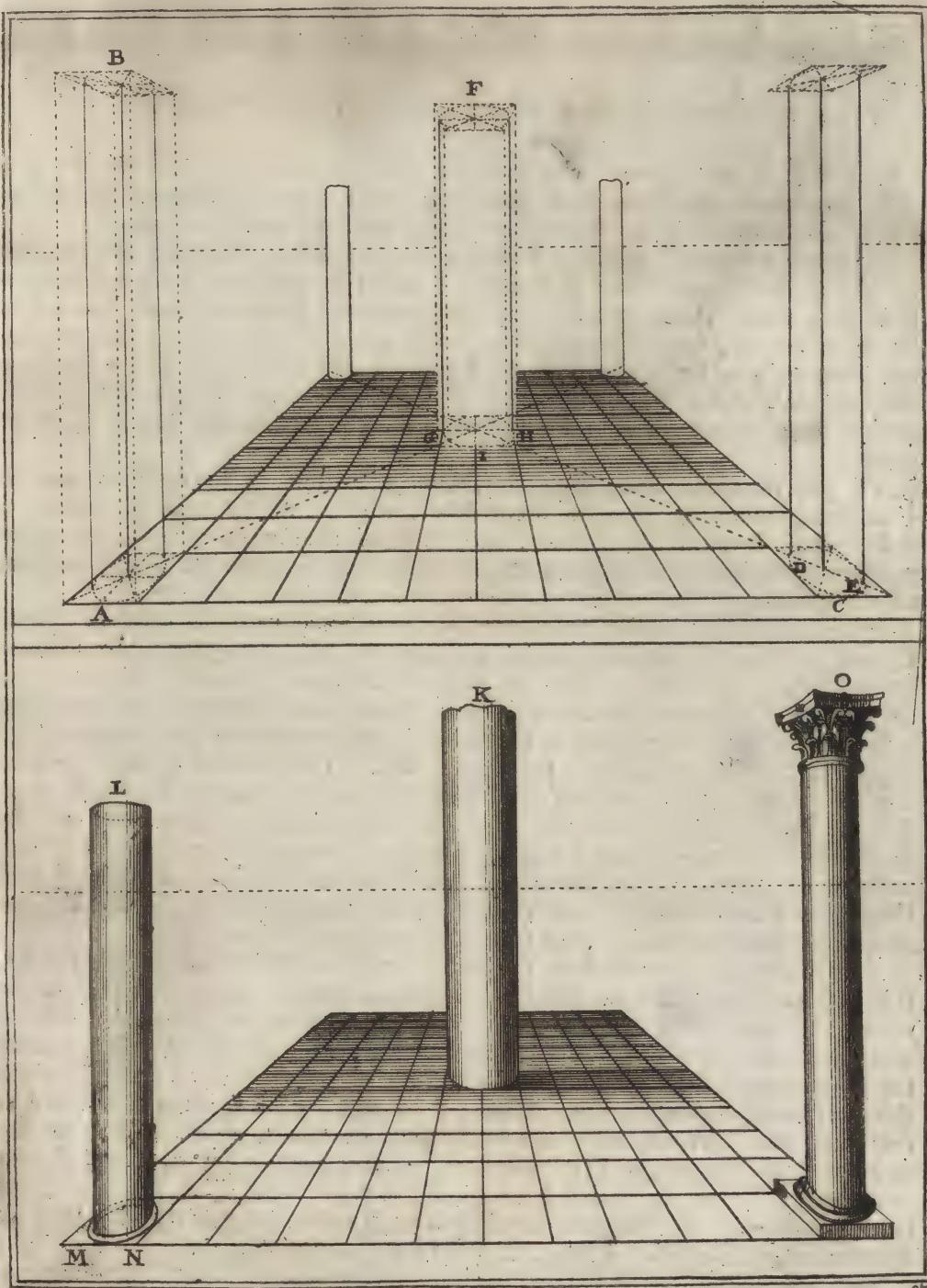
COLUMNS in Perspective.

WHAT has been just observed is not confined to the Cube, but extends equally to any Thing intended to be rounded. For Instance, if from the Square, A, you would raise a round Piece, AB, describe a Circle within the Square, according to the common Rules; and at the intended Height describe another Square, with a Circle within it, B. Now to get the two Lines DE, which make the Thickness, or Diameter of the Circle, observe where the Circle cuts the Diagonal of the Square, and take those Points for the Lines which form the Sides of the Elevation. Thus C is formed by Perpendiculars raised from the Intersections DE of the Circle with the Diagonal of the Square.

Thus much Regards Side-views. As to those in Front, *ex. gr.* the Figure F, they are always to take up the Semi-circle GHI, and Perpendiculars are to be raised from the Extremes of the Diameter GH; and both in those in Front, and those in Side-views, Perpendiculars to be rais'd from the Center, to give the Diminutions.

As to the three Figures underneath, beside that they shew the former more clearly, and with the Addition of Shadowing, they likewise serve to point out the Manner of proceeding for Columns. The middle Figure, K, is quite round, without any Ornament at all. The second, marked L, shews, that when a Base is required, a double Circle must be described on the Square that serves as a Plinth, whose upper Part is MN; the Interval between the Circles to be the Projection of the Base, and the inner Circle the Plan of the Base, from which Perpendiculars are to be raised.

The third Figure, O, is a Column with its Ornaments; which every one is to make at his Discretion; taking Care the Abacus answer, as it ought, to the Plinth.





CORNICES and MOULDINGS in Perspective.

AFTER the *Columns*, which are the chief Ornaments of Architecture, we proceed to the *Cornices*, or *Mouldings*, with their Projectures; which have hitherto been omitted, for Fear of rendering our Elevations perplexed.

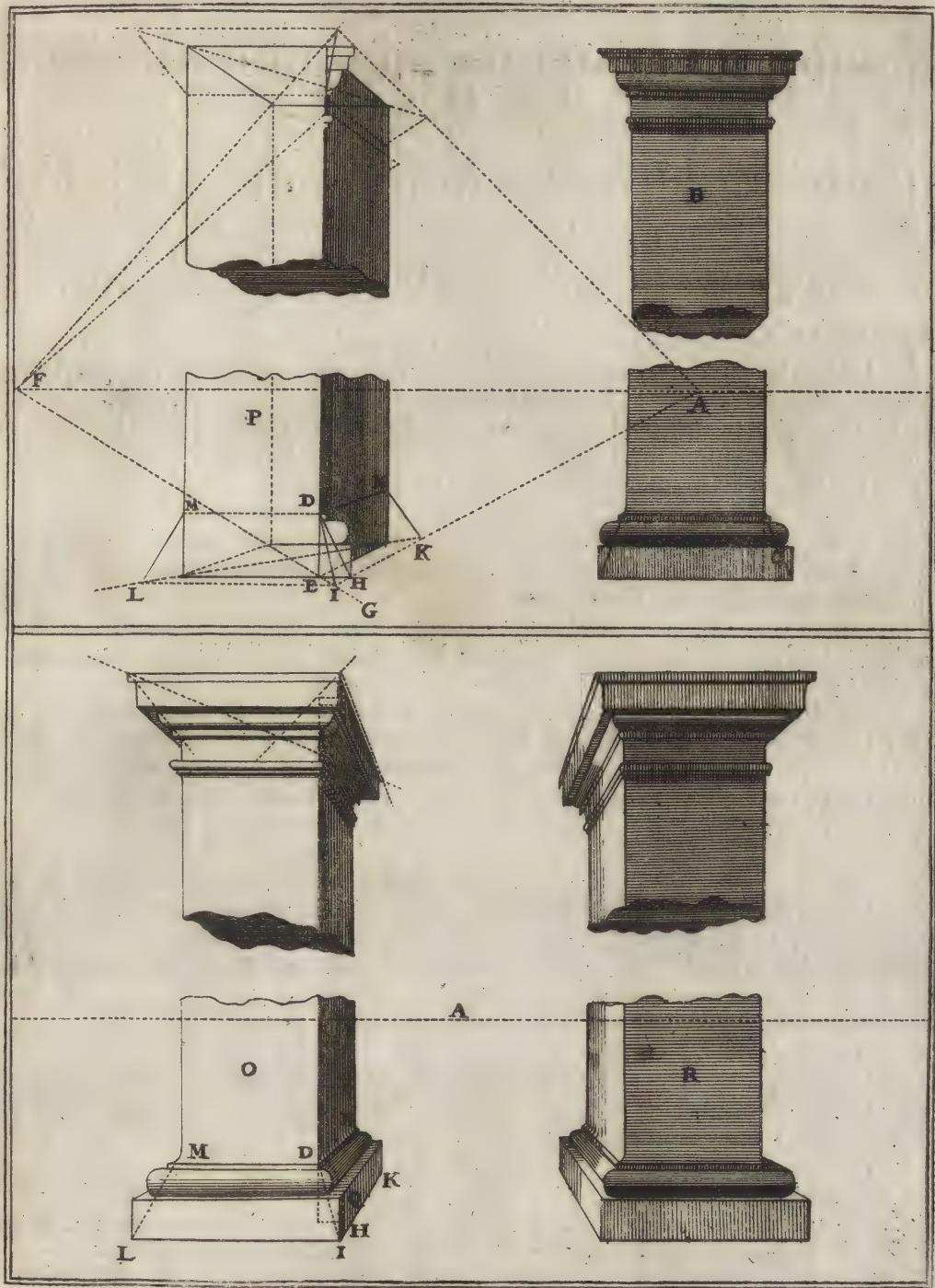
'Tis certain there is scarce any Building but has some Moulding or Projecture by way of Enrichment, and to render it pleasing to the Eye; for this Reason we have here judged proper to add what relates thereto: Not, we mean, to the Construction thereof, for that depends on every one's Fancy; nor to the Measures and Proportions, for in that Case we should be obliged to give all the Orders of Architecture, and a Thousand other Things, which the Reader will find elsewhere: But to put them in Perspective, when any particular Order is pitched upon.

To put the Ornaments, for Instance, of a Pilaster in Perspective, take the Proportions from the Profile of some other, with all the Ornaments thereof, as A B; whose Breadth being taken, and a square Plan made as usual, erect Perpendiculars from all the Angles thereof: Thus will you have the Body, or Shaft, of the Pilaster.

Proceed now to take the Projectures, or Jettings *ex. gr.* the Base of the Pilaster C, and the several Measures thereof lay down in D E. To put this in Perspective all round the Pilaster, from the Point of Distance F draw a Diagonal to the Point E, and farther at Random, as to G; then from A draw a Line to the Bottom of the Projecture H, and in the Point I, where this cuts the Diagonal, will be the Jet, or Projecture, of the whole Base. The same Line A H gives the Projecture of the Bottom, by its Intersection with the other Diagonal in K. For the Projecture of the Front, from the Point I draw a Parallel to the Base Line, till it cuts the Diagonal in L: This gives the other Corner of the Projecture of the Front. Then drawing Lines from the Top of the Base to these Points, as from M to L, and from N to K, you will have the Breadth and Height of the whole Base. The same Method serves for the Capital.

The Figures underneath shew the rest; and even the Effect of what is said, free of Confusion. For the Pilaster O, Regard must be had to that above it, P, where the Line D H has upon it all the Intersections of the Base. For this Reason Lines are to be drawn from the Point of Sight A, which passing through the Divisions of D H, will express the same on the Lines D I and N K; then Parallels being drawn from the Points D I to M L, nothing remains but to draw the Out-Lines. When there happen Squares, or Fillets, either at Top or Bottom, they are formed by Perpendiculars. Thus, for the Plinth, Perpendiculars must be raised from the Points L I K, and from the Point of Sight A a Line to be drawn through the Angle of the Plinth to Q; this will give the Height of the Perpendiculars I and K. Lastly, L is to be made equal to I.

This Instruction for the Base will suffice for the Capitals; the Operation being the same in both. The last Pilaster, R, is only meant to shew one clear of Lines. They are all broke in the Middle, that there might be Room to express both the Base, and the Capital; the Page not allowing them to be represented whole.





A large CORNICE above the Horizon, in Perspective.

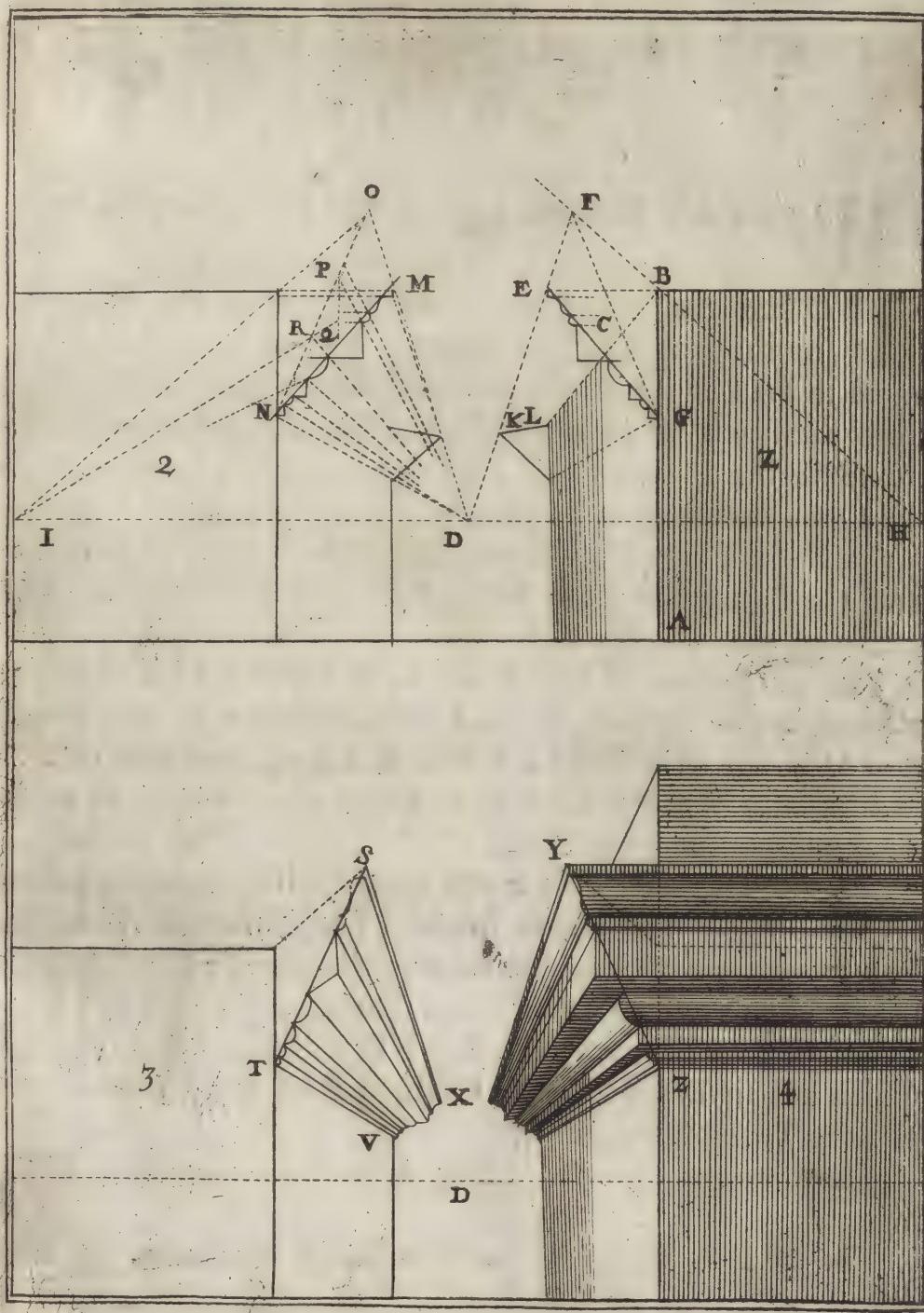
THE Method is the same as that just delivered; but being somewhat troublesome by Reason of the Number of Lines, we have judged proper to repeat it again here, in order to avoid Confusion.

To the Purpose then: Having taken the Profile of the Cornice, and its Projection, you are to transfer it to the Place where the Draught is to be made; as here the Profile C, &c. is at the Corner of a Wall A B. To find what Height it must have, and to make it shew its Bottom, from the Point of Sight D draw a Line through the Extreme of the Profile E, as the Line D F; then draw a Diagonal from the Point of Distance H, passing through the Corner of the Wall B, and prolonged till it cut the Ray D E in the Point F; from which draw the Line F G, which is to represent the Angle in Perspective, and to receive all the Measures of E G. The Corner of the other End of the Wall, K L, is to be drawn to the Point of Distance I, as being the other Diagonal.

In Fig. II. it is shewn, that all the Figures which are on the Line M N, are to be transfer'd, by Means of visual Rays drawn from the Point of Sight D; upon the Line N O; in order for Parallels to be drawn through all those Points, which are to give the Cornice complete. But before we go farther, it is to be observed, as has been already hinted, that all Plat-bands and Squares are formed by Perpendiculars. Thus, for Instance, to form the large Square of the Cornice, having made the Doucine, and the Fillet; from the Bottom of the Fillet, which is the Top of the Square, let fall the Perpendicular P Q: Then, to find the Place it is to be cut in, to shew the Bottom, a Line must be drawn from the Point of Distance I, through the Point a-top of the Quarter Round R, to the Perpendicular P Q; and you will have your Desire. What has been said of the large Square, holds equally of the lesser ones; as the Denticles, Fillets, &c. which are all to shew their Bottom.

The third Figure shews, that having found all the Points, and drawn Lines on the Line of the Angle, S T, proportional Mouldings must be drawn thereon. I mean, that when they project much, as is here the Cafe, by Reason the Point of Distance is near, the Mouldings must be helped out a little; that is, the Quarter Round must be inclined a little, the Doucine be erected, the Fillets enlarged; and the same done at one End as the other; ex. gr. the same on V X as on S T. This done, all that remains, is, to draw Parallels to the Base Line.

The fourth Figure is the Cornice complete. In this we have drawn Parallels from all the Points of the Line of the Angle Y Z; and one End of the Wall is made to pass over the Cornice, to shew, that we are at Liberty in such Matters; and that the Rule is general.





To find the Bottoms of large PROJECTIONS.

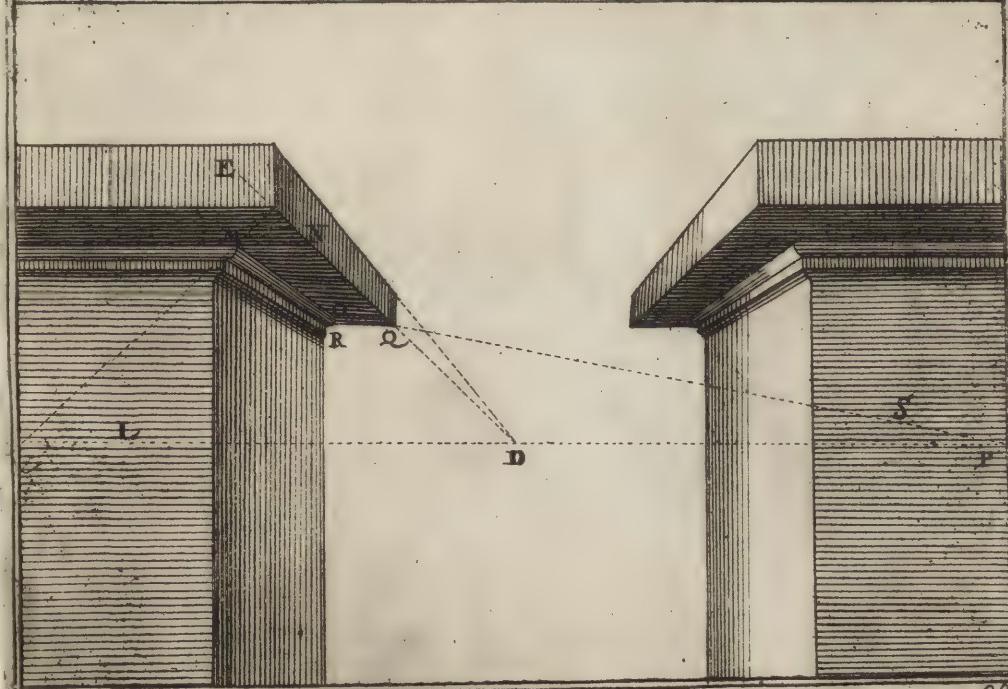
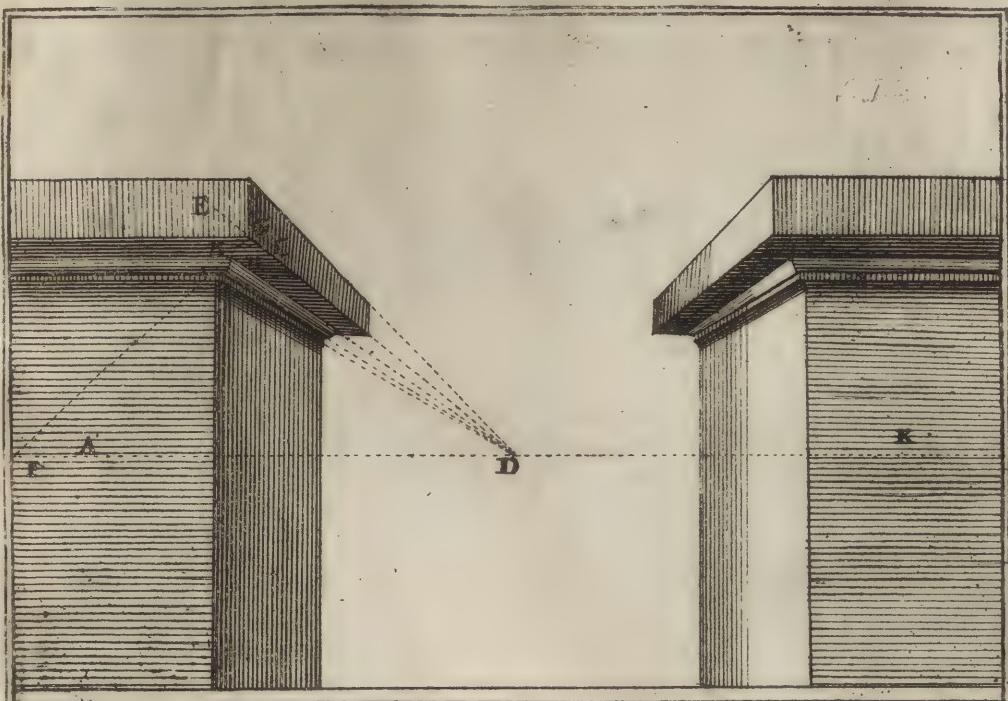
TO find the Projection of the Corona of the Wall A ; on the Angle of the Quarter Round B, make a Line equal to the Length of the intended Projection, as BC ; then from the Point of Sight D, draw a Ray E, passing to the Extreme of the Measure C : This done, draw a Diagonal from the Point of Distance F, passing through the Quarter Round B ; and the Point G, wherein it intersects the Ray DE, will give the Bottom on both Sides, BH : As is more clearly express'd in the opposite Figure K.

The Projection of the Wall L, is formed after the same manner as the former, A. All the Difference is, the Projection M N, of the Wall L, is half as big again as that of BC ; to intimate, that the same Rule makes them as big, or as little as one pleases.

'Tis likewise observable in the same Wall L, how the Return of the Projection, &c. is found. For Instance, from the Point O of the Quarter Round in the Fund of the Wall, a Diagonal is drawn to the Point of Distance P ; and the Intersection of that Line with the Ray ED will be a Point, through which a little Parallel to the Horizon R Q being drawn, will give the Thing required.

The same may serve for all Squares on Cornices and Mouldings both great and small.

The Wall S, shews all the Mouldings on that of L, more distinctly.



A a

The APERTURES of Doors in Perspective.

HA VING hitherto kept pretty close to the Order observ'd in the actual raising of Buildings of all kinds, we now proceed to shew how to furnish and dispose them for the Reception of Guests. We begin with wooden Doors; hereafter we shall find occasion to speak of other Apertures, as Windows, Cupboards, &c. then of Moveables, as Tables, Beds, Chairs, Chests, Benches, &c.

All Doors made to open and shut depend on the Pleasure of the Person who may open them as far and as little as he pleases. For this reason I shall shew a Method of putting them in Perspective, at any Degree of Wideness at Discretion.

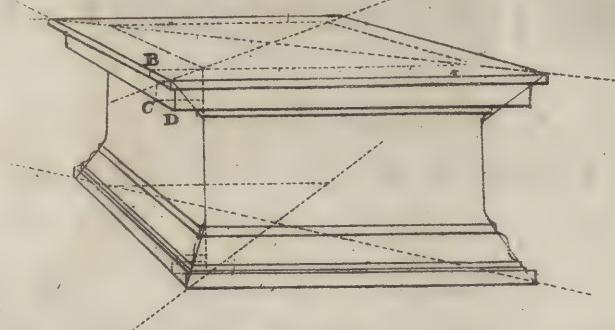
Now it is observable, that Doors, Windows, Cabinets, Chests, and, in fine, all Things intended to open and shut, always describe a Semi-circle in opening. The reason is, that the Side hung by Hinges keeps its Place, like the fix'd Leg of a Pair of Compasses, while the other Side, like the other Leg of the Compasses, sweeps its Arch. Thus in the Plan underneath the Figure, the fix'd Side being at A, and the other at B, if you open the Door quite, the Side B must describe the Semi-circle B C D, whose Centre is A. Hence it follows, that if the Door be three Feet broad, as in the present Case, its Semi-diameter A C will likewise be three Feet, and its whole Diameter B A D six Feet. Of these six Feet in Length, and three in Breadth, a Plan must be made, consisting of eighteen Squares, wherein a Semi-circle A B C D is to be describ'd, to render the making of the same Semi-circles in Perspective the more easy: Always observing where the Semi-circle of the Plan cuts the Squares; that those in the Perspective may be cut after the same manner, and a Semi-circle be drawn, taking up the same Space, traversing as many Squares, and cutting them in the same Places. An Instance of which we have in the Door E, where the Intersections are mark'd the same as in the Plan underneath, 1, 2, 3, 4, 5, 6, 7.

When a Door is to be represented open, in Perspective, a Semi-circle must be struck on its Plan, and the Point of Aperture placed on any part thereof at pleasure: Thus for the Door E the Point of Aperture is fix'd at 2. From this Point 2 a Perpendicular must be rais'd, 2 H; and from the same Point 2, a Line must be drawn through the Corner of the Door F, and continued till it cut the Horizon in the Point G; from which another Line must be drawn through the other Corner of the Door I, and continued till it cut the Perpendicular rais'd from the Point 2, in the Point H: Thus will you have the Door open, F I H 2.

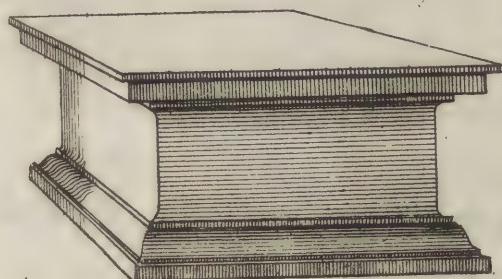
All Apertures are perform'd by the same Rules; as is farther seen in the Doors K and L. The Door K shews its Out-side, and that of L its Inside; yet both are perform'd after the same manner as the first. The accidental Point of K is the Point M in the Horizon, and that of the Door L is O. If Bolts, Locks, or the like, be added on the Doors, they must all be drawn from the same accidental Point; as the Bolts and Lock of L tend towards O. What accidental Points are, we have already explain'd. Now all Apertures have one such Point in the Horizon, excepting two sorts: The first, when the Door is quite open; in which Case its accidental Point is the Point of Sight: The other, when 'tis parallel to the Horizon; by reason the Parallels, in that Case, never intersect: as in the Door N.

A

fig.



2 fig.



A a 2

91

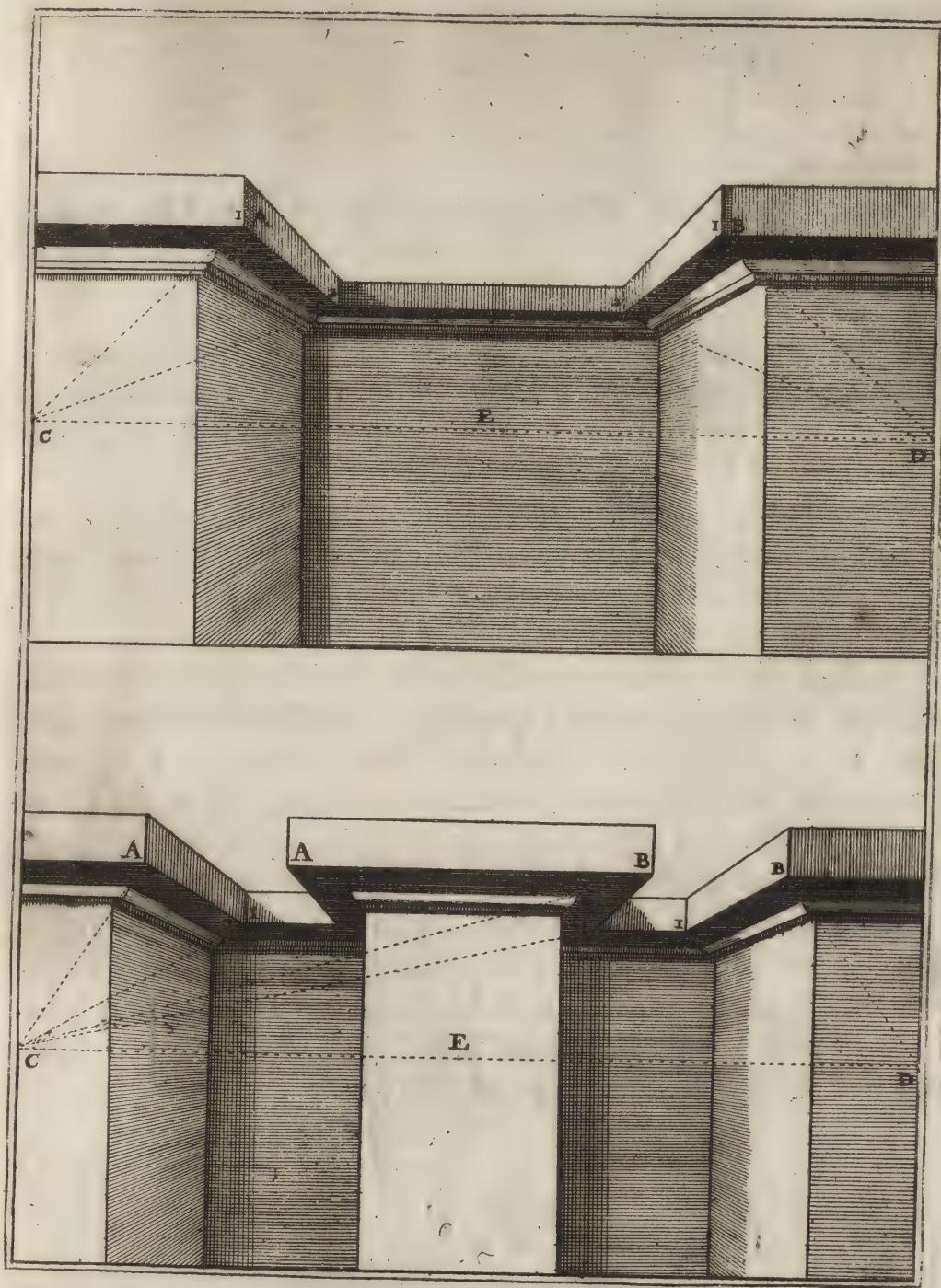


CORNICES with several Returns.

WHEN there happen divers Turns and Returns in the Cornices or Mouldings, their Bottoms must always be taken from the Points of Distance. Thus, having drawn Rays, A and B, to the Point of Sight E ; from the Point of Distance C, or D, a Diagonal must be drawn through the Angle of the Quarter Round O, till it cut the Ray A or B in I : From which Point, I, a Parallel to the Base being drawn, gives the Bottom or Projecture of the Square; as already shewn in *Pag. 90.*

I would willingly have made a much bigger Cornice; as that would not have been a whit the more difficult: But the Compass of the Page oblig'd me to be contented with this.

If you would have Returns on the Ground, as these are above the Horizon; the same Method is to be observ'd. For Proof of this, invert the Paper, and you'll find it have the same Effect.





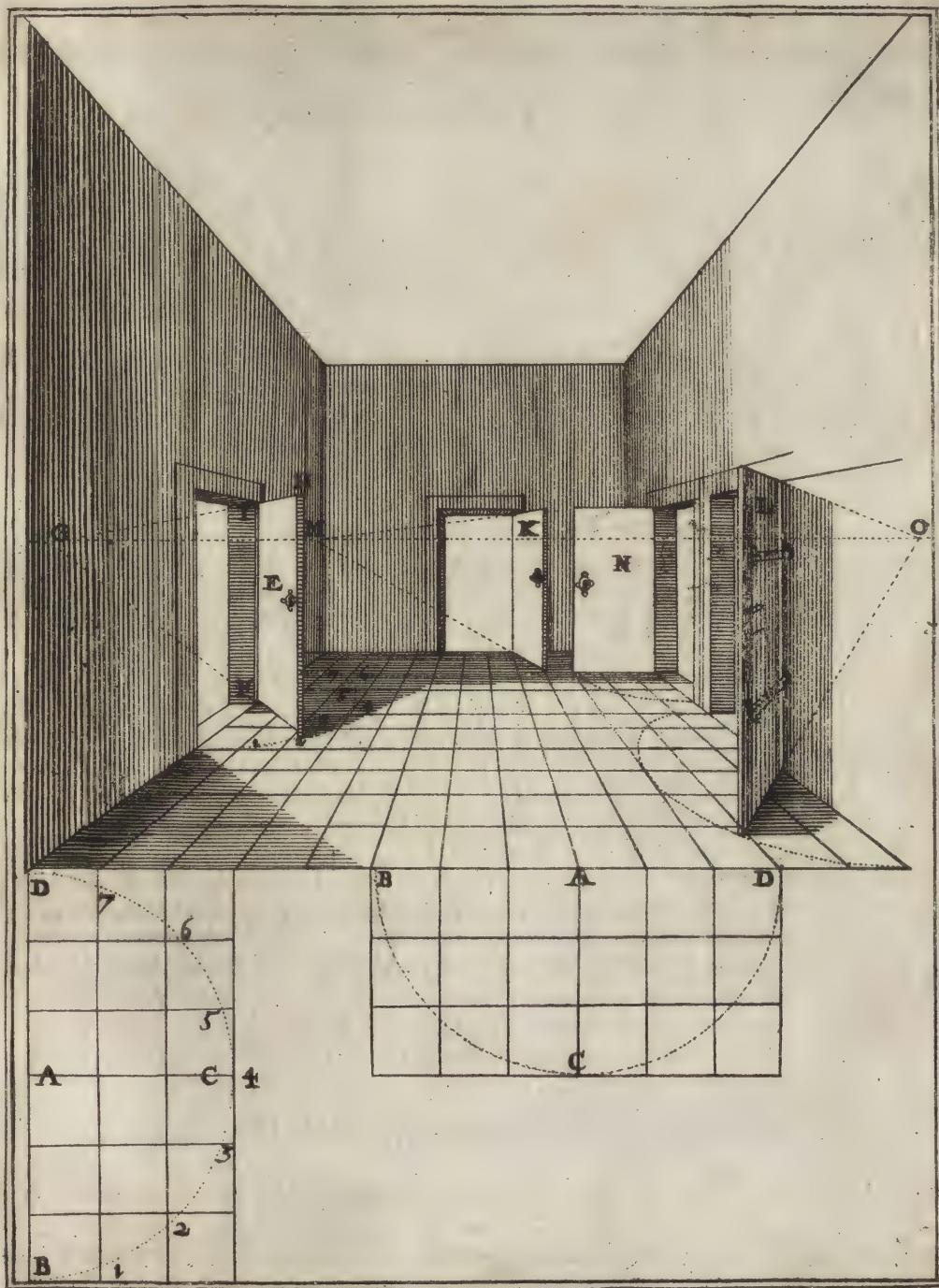
CORNICES and MOULDINGS below the Horizon.

TH E Rules that obtain here are the same with those of the preceding Cases ; tho', through an Accident which sometimes falls out, *viz.* a Diversity of Horizons, there arises a little Variation ; which such as are unacquainted therewith might chance to be puzzled withal.

We observe, then, that in viewing a Cornice below the Eye, and of consequence below the Horizon, the Projectures hide sometimes half, sometimes more, and sometimes less of the Body, according as the Eye is more or less elevated.

To find precisely how much is to be covered, and how much not; set the Profile of the Moulding on the Corner of the Body to be enrich'd therewith; and having found the Line of the Angle, after the manner already directed, draw the Divisions of the Profile upon the same : Thus will you find that the Square, or Plat-band, covers the whole Astragal underneath, and only lets half the Fillet be seen. For, drawing a Line from the Point of Sight A, through the Profile B C, it cuts the Perpendicular from the Line of the Angle in D, and shews how much is to be cover'd. For the Moulding at Bottom the same Method serves as for that at Top.







A P E R T U R E S of Casements in Perspective.

AL L the Difference between the *Apertures of Casements*, and those of *Doors*, lies in this, that Doors have their Semi-circle of Aperture on the Plan, and Casements in the Air; by reason Windows are rais'd, and Doors usually turn on the Ground. On this Account, the Semi-circles of Casements may be either over or underneath them: And in such Semi-circles is the Point of Aperture to be placed.

Thus, for Instance, if a Casement be two Squares, or Panes, broad, as A B, and it be made quite open, it will then take up two Squares more C A, whereof A is the Middle, and the Centre of the Semi-circle A B C. But by reason the Window is rais'd above the Ground, the Semi-circle must also be rais'd; as is here actually done in the Semi-circles of the Windows D and E: whereof the same D, and E are the Centers; and which are easily form'd by erecting Perpendiculars from the intermediate Squares, till such time as they intersect the Rays drawn from the Corners of the Casements D, E. From these Intersections Lines must be drawn to the Base-line, and the Measures of the Squares of the Plan 1, 2, 3, be set thereon. From the same Points 1, 2, 3, Lines are to be drawn to the Point of Sight F; which cutting the Parallels, will give Squares to fix the Aperture by. Proceed then to take the Apertures after the same manner as those of Doors. For Example, the Point G being given in the upper Semi-circle, from the same G, draw two Lines; the one, G H, perpendicular; the other passing through the Corner of the Window E, and cutting the Horizon in some Point, e. gr. the Point I. From this I, draw a Line through the Corner of the Window K, till it cut the Perpendicular in the Point H, which gives the Casement open, K E G H. The same is to be observ'd with regard to all the rest; and the Point still to be taken in the Horizon. Thus, L is the Point for the Casement M; and N, that for the Casement O. The Casement P has none at all, as being parallel to the Horizon.

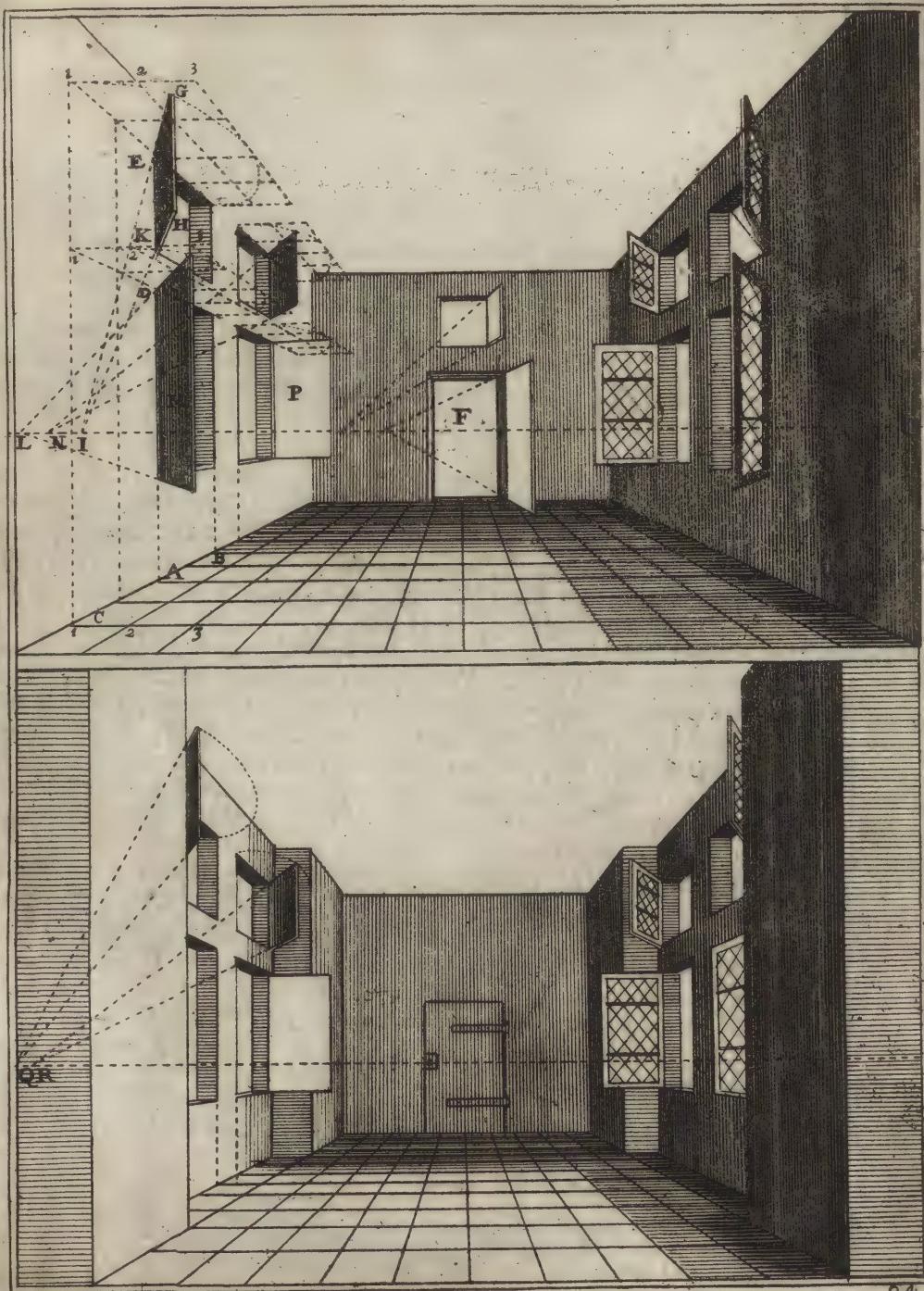
The Casements on the other side are perform'd after the same Method, without any of the Confusion of Lines. Both the one and the other range with the Wall, to facilitate the Operation. The Door at Bottom is done after the manner already directed; and the Casement according to the Method last deliver'd.

A P E R T U R E S of Casements, with Embrasures.

TH E Rules for these are the same as for those that range even with the Wall; excepting that the former are not capable of being quite open'd, by reason of the Thicknes of the Chamfraining, or Embrasure. On this account we never give them a whole Semi-circle, but a Portion answerable to the Aperture they admit of. The accidental Point should always be in the Horizon, for upper Windows, as here in Q and R; that below is parallel to the Horizon.

FRACTICAL.

94



Bb



Divers other APERTURES.

THE Openings of Cupboards, Presses and Chests, are at least as necessary as those of Doors and Windows; nor had the Omission of those been a whit more excusable than of these. Their Doctrine will be dispatched in two Figures.

The Cupboards A A, are opened according to the Rules delivered for Casements, which it would be needless here to repeat. We shall only add, that the uppermost is parallel to the Horizon; and that the latter tends to the Point of Distance B.

The Shop on the other Side is opened by two Leaves, one of them rising upwards, and the other falling downwards. Each of them describes its Semi-circle from the Centres C and D; which being drawn with the Compasses, the Apertures are fixed at any Point at Pleasure; as here in the Point E; from which a Ray is drawn to the Point of Sight F, till it intersect the Semi-circles at the other Ends in the Points G. From these Points E and G Lines being drawn to the Centres CD, give the Leaves that close the Shop.

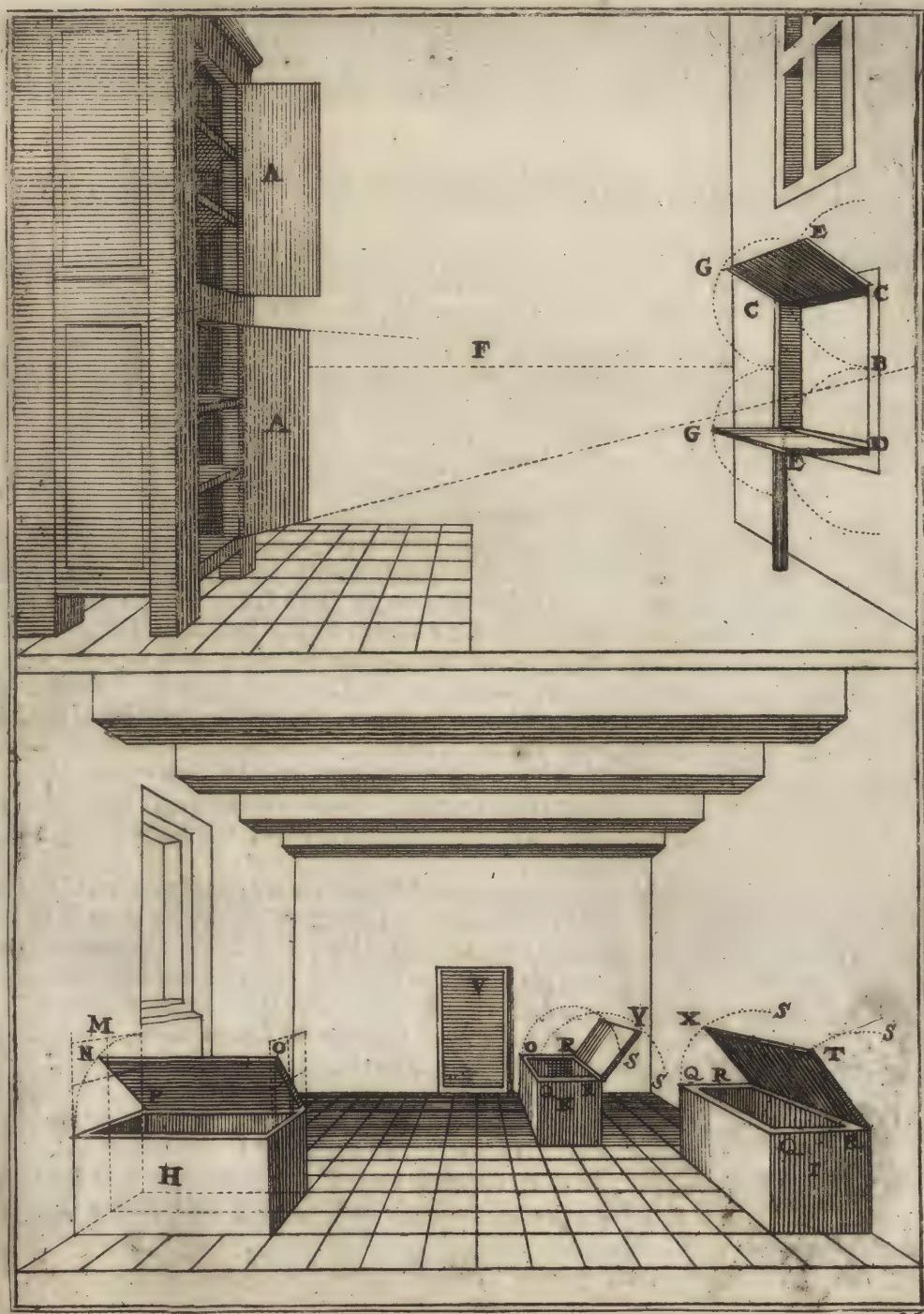
In the lower Figure there are three Chests, differently opened. To open the first, H, the Quadrant M is put in Perspective, according to the Measures of the Squares of the Plan. Thus, observing the Width of the Chest, which is two Squares, Perpendiculars are to be raised thence, and a Semi-circle, or Quadrant, described for the Opening, which is here fixed at the Point N; and from this a Parallel is to be drawn to the other Quadrant O; and from N and O Lines to be drawn to the Center P. If a greater Aperture is required; a Semi-circle to be drawn in Lieu of a Quadrant.

The Chest I has the easiest of all Openings: For, having taken the Breadth of the Chest Q R, from the Centre R describe the Semi-circle Q S; then take any Aperture at Pleasure, as T, and draw a Line to the Point of Sight V, cutting the other Semi-circle in X; and, lastly, from the Points T and X, draw Lines to the Corners R.

If 'tis required to open them farther, you have only to fix the Point of Aperture higher in the Semi-circle; as Y is in the Chest K. The rest is the same as in the first Chest.

PRACTICAL.

95



95

B b 2



Plans and first Elevations of Moveables.

THESE Plans I should have placed in their order among the rest, but for this Consideration; that had I treated of them at the Beginning of the Work, without shewing the Necessity thereof, they would have passed for useless, and accordingly have readily dropt out of Remembrance. They now come in Season, and cannot fail of being well received and learnt with Pleasure; inasmuch as there are no *Moveables* or *Household Goods* but depend upon them.

The first Plan, A, may serve for *Beds*, *Tables*, *Chairs*, *Stools*, &c. The other B, which is twice as long as 'tis broad, serves for *long Tables*, *Cupboards*, *Buffets*, *Chests*, *Trunks*, &c. The third, C, which is long and narrow, serves for *Benches* or *Forms*, *Couches*, and other Things with six Feet.

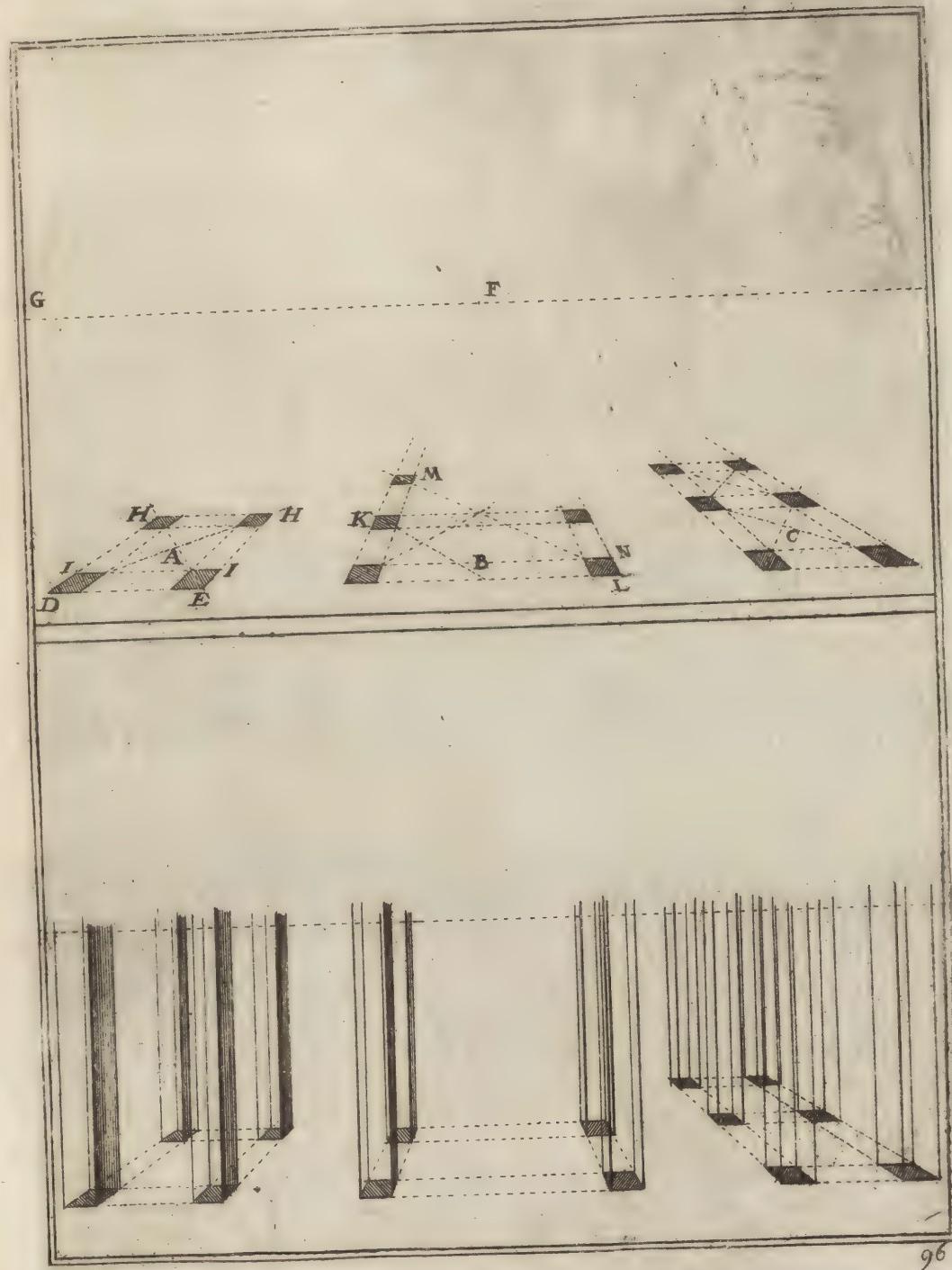
The Acquaintance the Reader is supposed to have with the other Plans already delivered, will render the Performance of these easy; there being nothing more required than to lay down their Dimensions on the Base Line, draw Lines thence to the Point of View, and shorten them by Means of the Points of Distances.

Thus, e. gr. for the first Plan A the two Measures of A and D must be set on the Base, and Lines be drawn thence to the Point of Sight F. Then from one of the Points of Distance, a Line to be drawn to one of those Measures, as from G to E; and through the Points H, and I, wherein it intersects the Rays, Parallels to be drawn; by this Means four Squares will be formed, which you may account as much or as little as you please. For a Table, e. gr. they must be more than for a Stool, i. e. they must have more Breadth; the latter being usually two Inches, and the former four.

The Plan B is performed after the same Manner; excepting that on Account of its Length, which is double its Breadth, a Line must be drawn from B to one of the Points of Distance, to find the half, K. For, if a Line were drawn from L, it would intersect in M, and give a whole Square; whereas we only want half of it. Parallels then must be drawn from K to the Points of Intersection with the Ray; and from the Corner L, a Line must likewise be drawn to G, intersecting the Ray: Thus will you have the first four Squares.

The third Plan, O, needs no Explanation; it being evident that it is formed like the first, A; and that the Square must be doubled to get the six little Squares.

From the Figures underneath it appears that Perpendiculars are to be raised from all the Angles of these Squares, to begin to form the Moveables, &c. laid down hereafter.





ELEVATIONS of Moveables.

HAVING raised Perpendiculars from the Plan, as already intimated; a Line of Elevation must be made in some Part of the Painting, on which the Heights, cross Pieces, &c. are to be laid.

Thus the Line CD being a Line of Elevation, and CE and DF Breadths or Depths of the cross Pieces; from these four Points draw Lines to some Place in the Horizon, *ex. gr.* the Point G. Then having erected Perpendiculars from all the Angles of the Plan, as in A and B; from the Angles draw Parallels to the Base Line, till they cut the Line CG: Thus will you have the Points 1, 2, 3, 4; from which Perpendiculars are to be raised. And the Intersections those Perpendiculars make with the Ray CE, will be the Points to cut the Perpendiculars of the Plans: Whether they be transferred with the Compasses; or whether they be cut by Parallels, as in the Figure; where a Parallel being drawn from the Point E, cuts the first Perpendiculars of the Plans AB in the Points O; from which drawing Lines to the Point of Sight H, the other Perpendiculars of the Plans will be cut in the Points PP, &c. And doing the like for the Point F, you will at Length have a Cube perforated on all its Sides: Which being well understood, all the other Pieces that follow, and even all that can be conceived, will be readily performed.

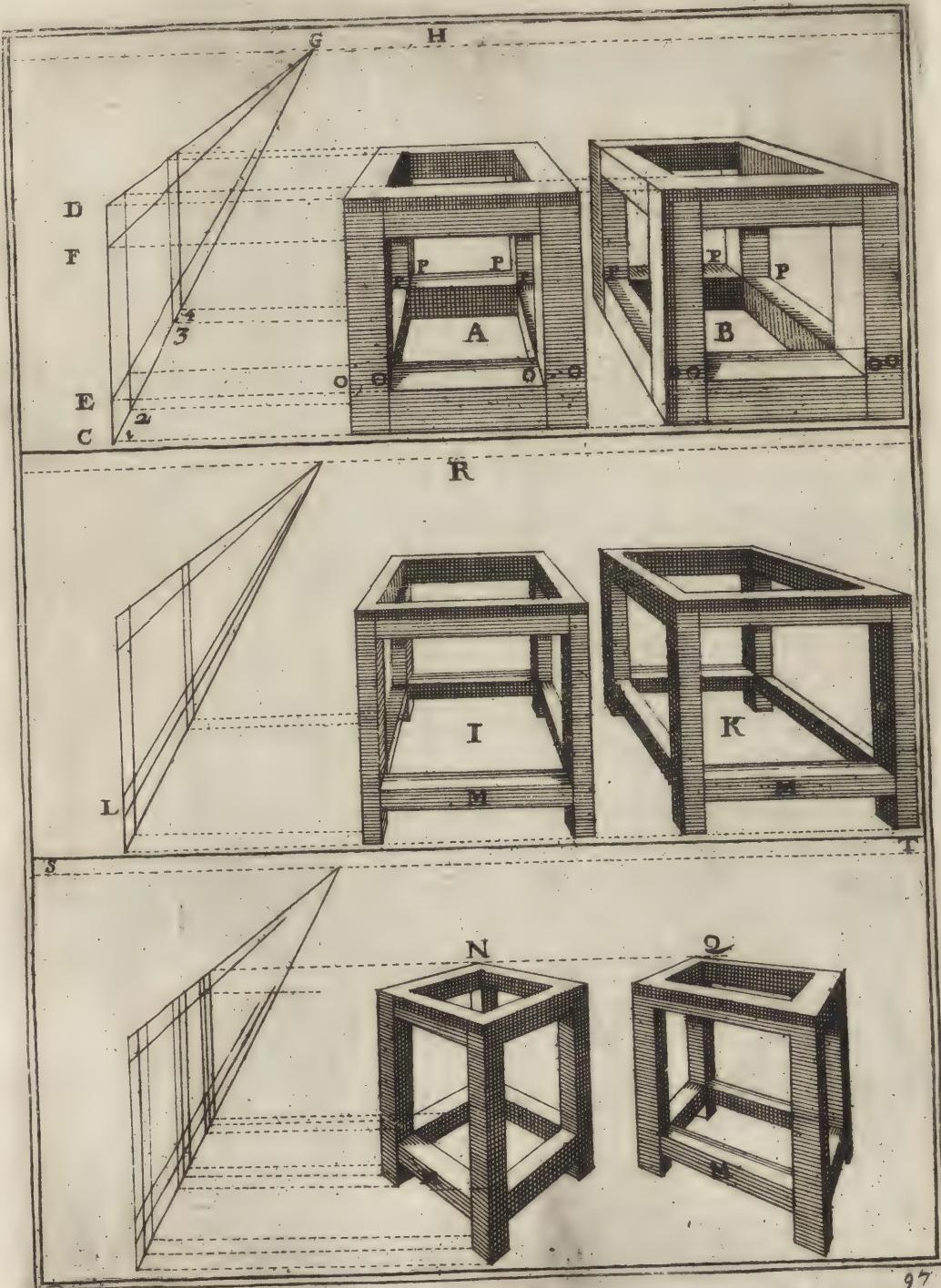
It is easily observed, that the two Frames or Stands of Tables, I and K, are performed by the same Rule as those above: All the Difference is in the Cross-bar at Bottom, which is higher in the Line of Elevation in this latter Case, than the former. In the latter, for Instance, we find it in the Line L, which gives MM. For what is beneath; one may either leave the Feet square, or round them into Bowls.

As to the last Frames, N and Q, there is nothing in them more than in I and K; only that they are viewed by the Angle, and the other in Front. The Plans of those, I and K, are drawn to the Point of Sight R; and these latter to the Points of Distance S, T.

These Figures furnish wherewithal to form all the Moveables of a *Ménage*. Thus, for Instance, to make a Bedstead of Fig. I or K, nothing more is required than to give it a proper Height and Breadth. In every Thing else the Operation is the same as for a Couch, a Stool, or the like: For a Table you have only a Top to add: For a Joint-stool, beside the Top, it must be made more in Height than Width. But the rest is all of a-piece.

PRACTICAL

97





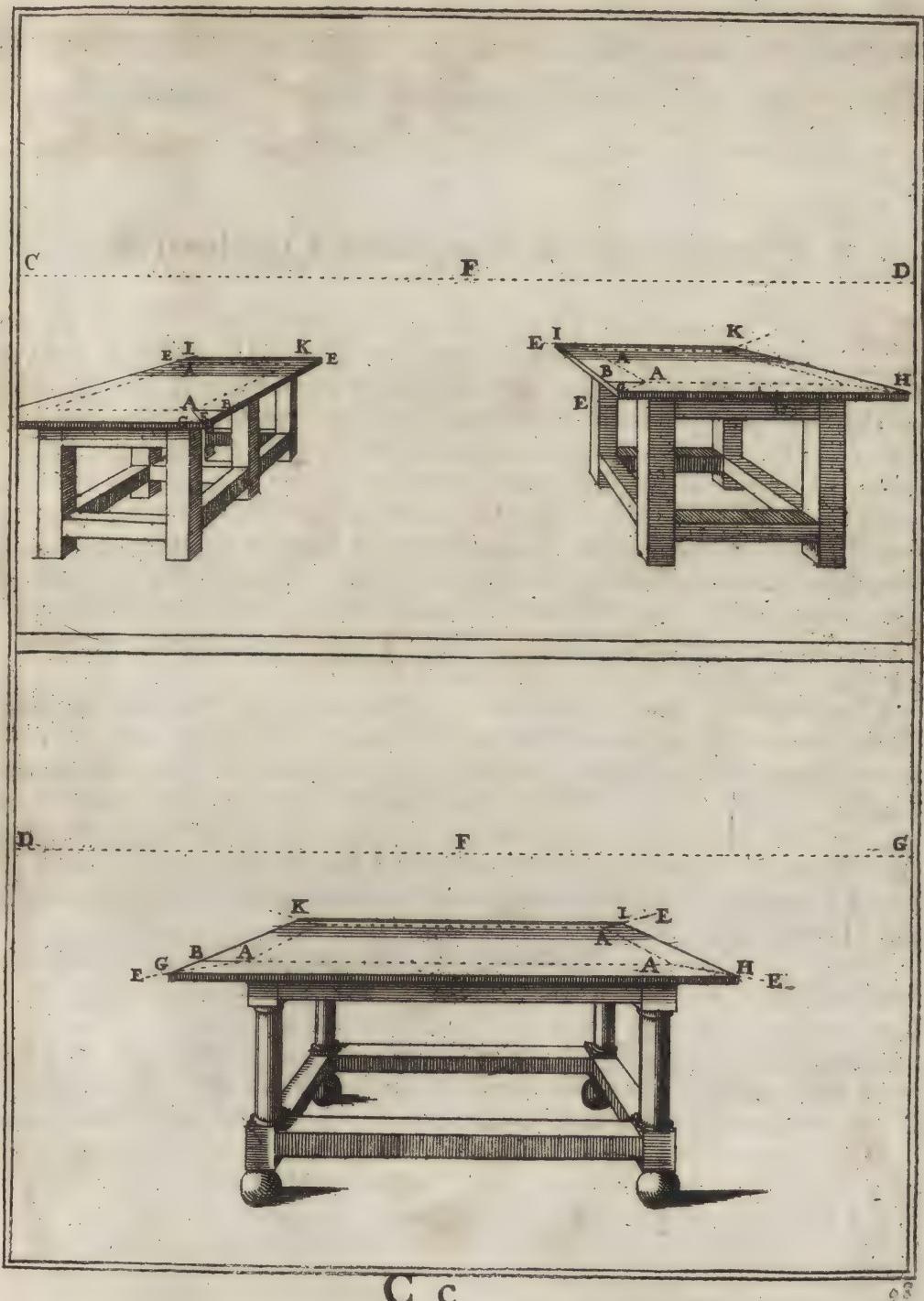
To make the upper Part of Tables, Stools, &c.

HAVING raised Perpendiculars from the Plan, as already directed, and fix'd the proper Height thereon, the Frame will be complete. Now to make an upper Part perfectly on a level, and which shall not exceed the Frame, there needs nothing more than to leave the Top of the Cube as it is, without expressing any Thing thereon; which will make the upper Part of a Table, Stool, or the like.

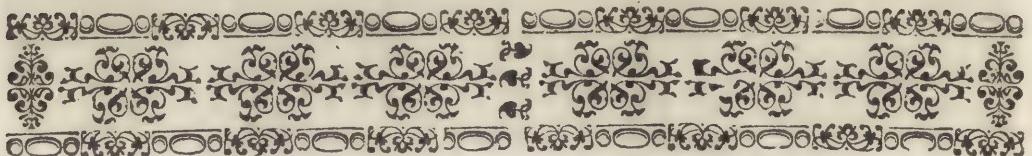
But if 'tis desired the upper Part shall have a Projection, or Ledge; from one of the Angles of the Frame a Parallel must be drawn, as A B; and on this Parallel the Measure or Quantity of the intended Projection must be set, as here AB. Then from the Points of Distance C and D, occult Lines, A E, A E, &c. must be drawn through the Angles of the Square of the Frame here expressed by dotted Lines. And to make the Measure A B give the proper Breadth to all the Sides and Angles of the Table; draw a Line from the Point of Sight F, thro' the Point B, continuing it till it cut the Line C A E in the Point G. From the Point G draw another Parallel, cutting the other occult Line in H. Then drawing Lines from the Points G and H to the Point of Sight F, the other Diagonals will be intersected in I and K; which will give the upper Part of the Table, with the Projection first set on the Line A B.

The Thickness of this upper Part of the Table is fixed at Pleasure.

This same Method may serve for the upper Parts of any Thing, whether above or below the Horizon; or whether in Front or in Side Views.



C c

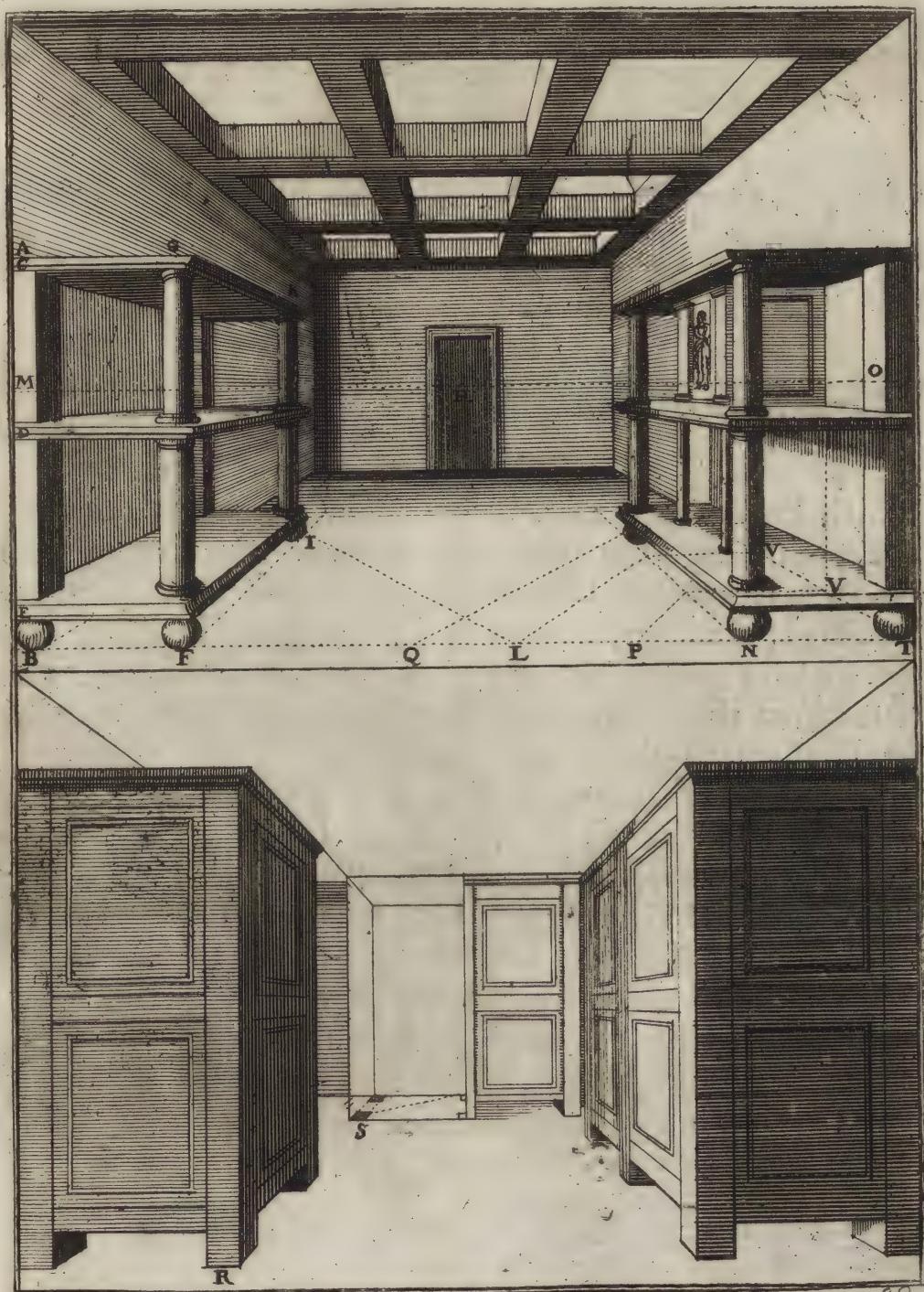


Elevation of Buffets, and Cup-boards.

HAVING made the Plan, and raised Perpendiculars from all the Angles, as already taught ; upon the Line A B, which is here to serve for a Line of Elevation, the Measures or Proportions of the Distances of the Shelves, with their Thicknesses, &c. as here C D E, must be laid down. Then from the Points C D E, draw Parallels to the Base Line, as far as the upright Post G F ; and from the Points thus mark'd on G F, draw Lines to the Point of Sight H, as far as the other Post I K, forming the Breadth of the Buffet. This Breadth is fixed at Pleasure, by laying down the intended Measure on the Base Line. Thus for the Breadth of the present Buffet, the Distance F L is laid down ; and from the Point L, a Line is drawn to the Point of Distance M ; and the Point I, wherein it intersects the Ray F H, is the Place of the last Post.

The Buffet on the opposite Side is performed after the same Manner. To adjust the Proportions of the little Cabinet, or Locker, supported by two Columns in the Middle thereof, take the Points L P, which are in the Middle of Q N, or of the Breadth of the Buffet ; and drawing Lines thence to the Point of Distance O, where the Ray N H is intersected thereby, draw Parallels to the Base Line, cutting the Ray T H in the Points V V. And Perpendiculars raised from those Points will give the little Cabinet in the Middle.

The large Presses, or Cup-boards, in Fig. II. are performed after the same Manner as the Buffets above ; only that in the Middle needs a little Explanation, by Reason it is viewed in Front, so that there might be some Difficulty in determining its Depth. We observe, then, that its Plan must be formed, as already directed, and as one half is here shewn. Then, to make cross Pieces equal to these in the Front, occult Lines must be drawn from the first upright Post R, to the first Perpendicular of the Depth S ; and from the Points of Intersection draw little Parallels to the Base : These give the Thing required.





ELEVATIONS of Chairs.

TO raise a Chair; from the Dimensions A B C, erect Perpendiculares, and proceed in the same Method already directed for Table-Feet, or Frames without Tops. All that is here farther, is the Back of the Chair; which may be made of any Height at Pleasure. In the present Case the Height of the Back is equal to that from the Foot A to the Seat K. Which Proportion may serve equally for Elbow Chairs.

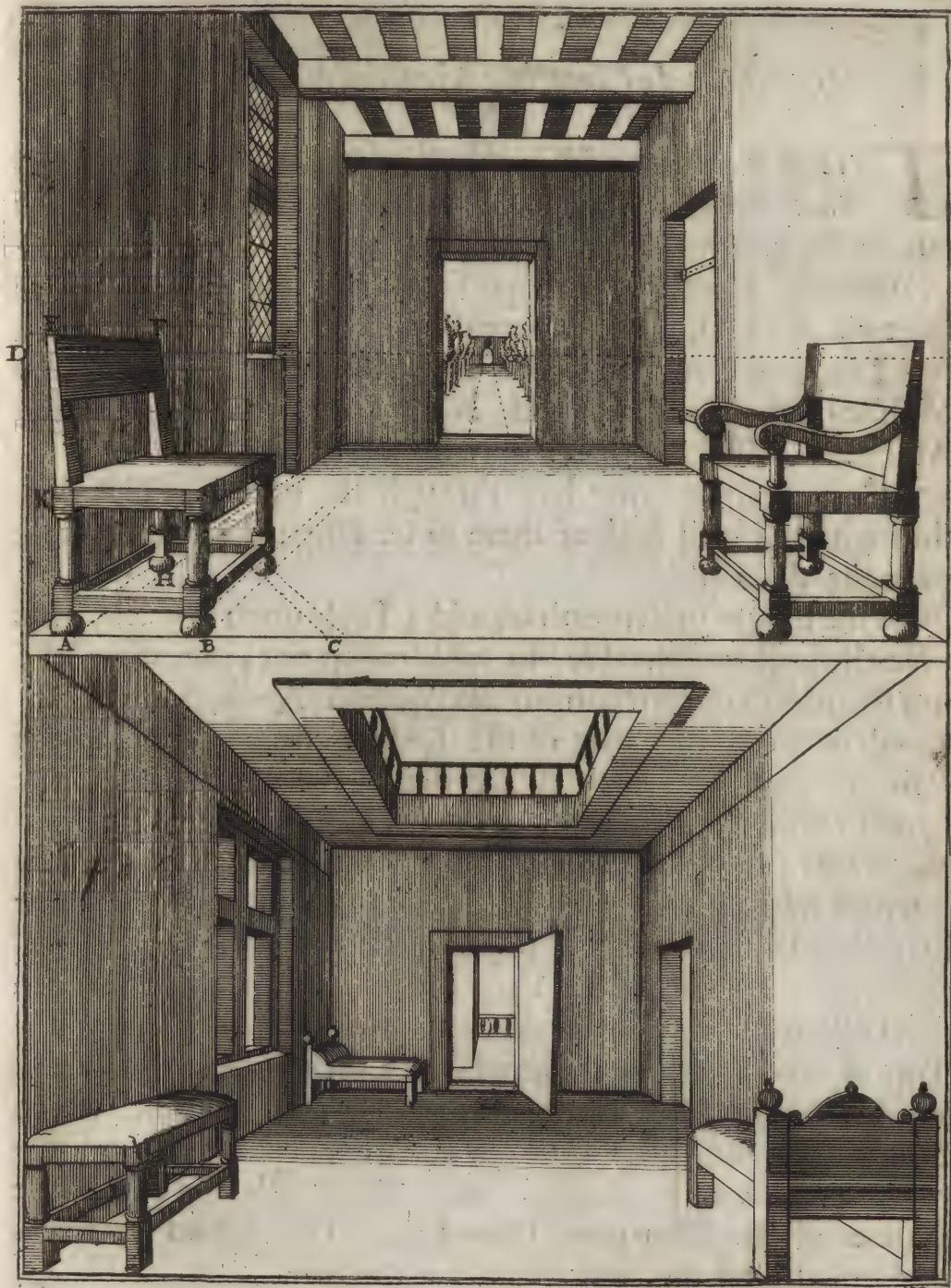
From the Figure it appears evident enough, that, to form the Back, there is nothing needed but to prolong the Perpendiculares of the Legs, as here A E; and from the Point E to draw a Line to the Point of Sight G; which cutting the Post raised from the Plan, or the Foot H gives the Point F. The rest the Figure makes clear.

If Elbows are required, you have only to prolong the Fore-Feet or Posts, as the Hind-ones are for the Back: And to draw a cross Piece, or Bar, as L M, for an Elbow.

In the second Figure underneath, you see a Form, or Bench, cover'd with Cloth, and two Couches. The Head of one of which is turn'd this Way, and the other view'd obliquely. It would be Los of Time to dwell upon the Manner of making them; the Rules being altogether the same as those already laid down for other Moveables, viz. by making a Plan, raising Perpendiculares, &c.

PRACTICAL

100



100

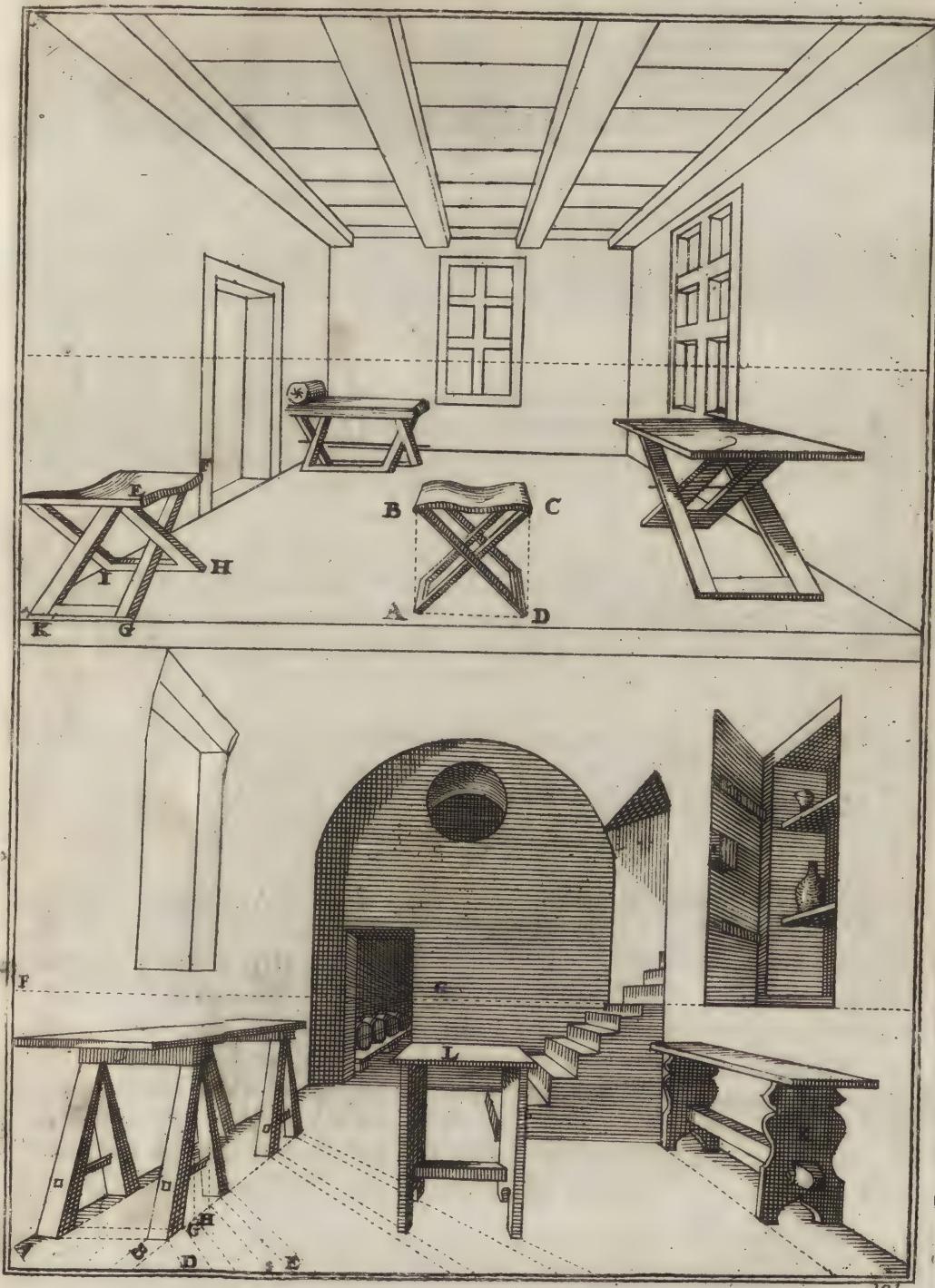
Another Method of putting Moveables in Perspective.

THREE are some *Moveables* that *fold*, or shut down, and that serve for Tables, Seats, Beds, &c. very easy to put in Perspective.

As to the Elevation, it is perform'd as that of a Cube, as shewn in A B C D, which is view'd in Front; or E F G H. Then two Diagonals, A C and B D, are to be made for that in the Middle of the Front; or E H, and F G for that of the Side: And these will serve for the drawing of the two Crosses; taking Care that one enter half through the other, as G K does through H I; and both of them to be fastened by the Middle to make them fold.

In the Figure underneath we add a Table upon Tressels, that even the least considerable Moveable might not be wanting. To put them in Perspective, from the Points A, B, which are the Interval between the Feet of the Tressels, draw a Line to the Point of Sight C; then, laying down the Thickness of the same Feet on the Base Line, as here D and E, draw Lines from the same to the Point of Distance F, and observe where they intersect the Ray B C; and from the Points of Intersection draw little Parallels to the Base Line; by which you will have the little Squares or Plans of the Feet, as in A and B: Then between the Distance D and E, lay down the Breadth intended for the Top of the Tressel, and drawing a Line thence to the Point F, it will cut the Ray B C in the Points G and H; from which Points, Perpendiculars are to be raised to any Height at Pleasure, as here to I. Lastly, from the Angles of the little Squares of the Plan draw Lines to I. The second Tressel is performed after the same Manner as the first.

The *Form* K, and the *Table*, or *Seat* L, need not any Explanation, to put them in Practice, as having nothing but what is common with the Pieces above-mention'd.





MOVEABLES placed without any Order.

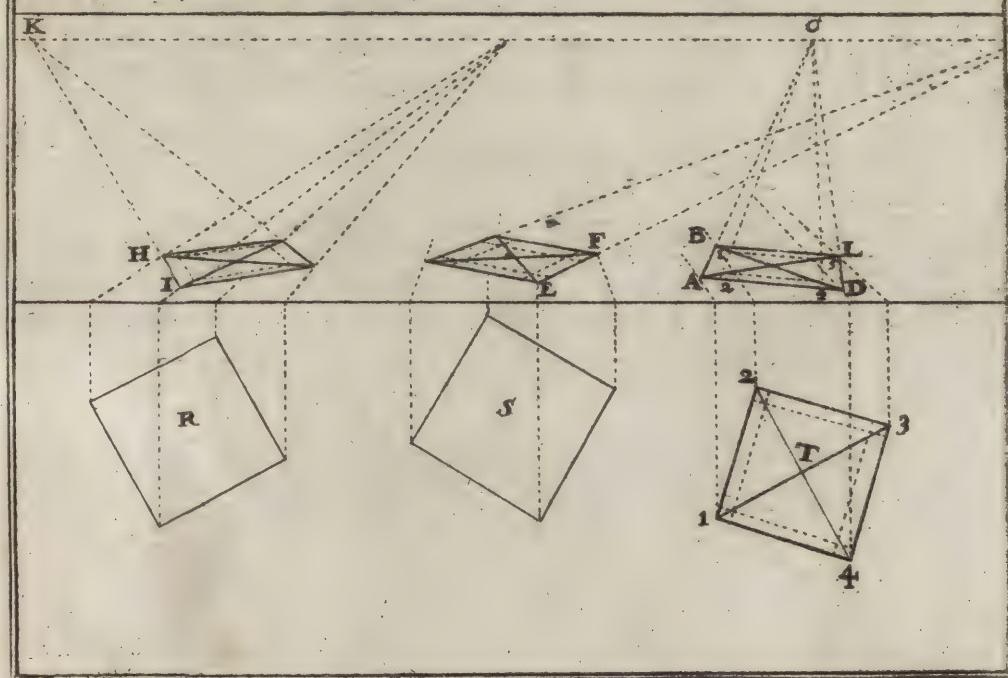
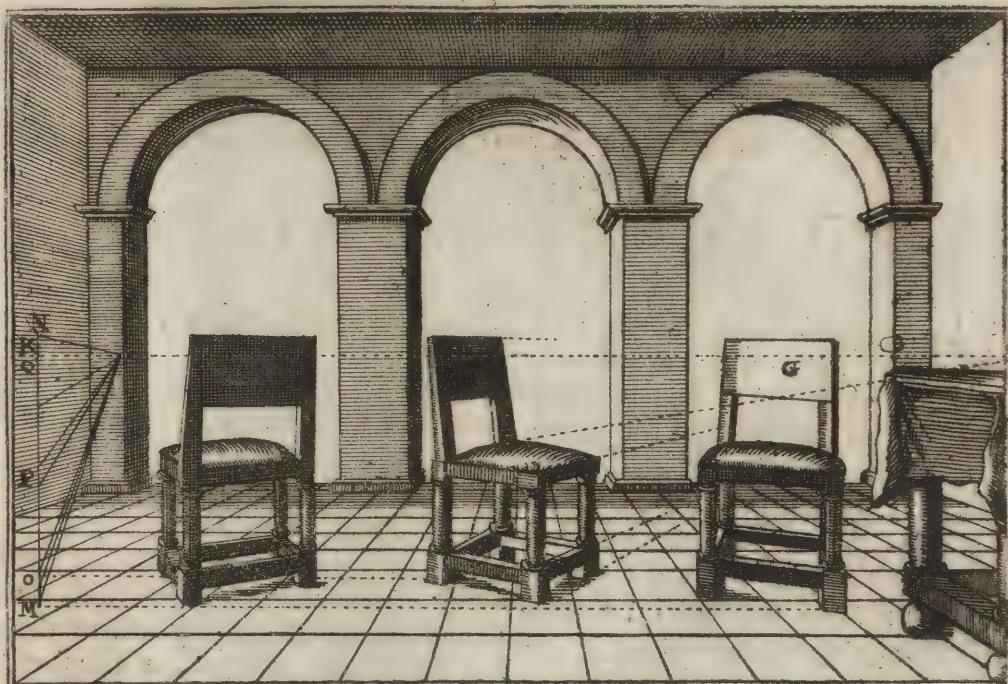
WHEN Moveables are placed orderly along the Side of a Wall, or in the Direction of the Rays and the Base Line, 'tis easy to put them in Perspective by the Rules already delivered: But if they be irregularly placed, as in this Figure, you are to proceed as we shall now direct. Draw the geometrical Plans, R, S, and T, for Plans of three Chairs; which are to be diminished by the Rule already delivered for the irregular Figure, *Pag. 40.* and the Plans will be found situated like the Chairs, or rather the Chairs like the Plans. Now the Plans being in Perspective, lay a Ruler along one of the Sides, to see what accidental Point it gives in the Horizon; thus, laying a Ruler along the Side A B, we have the Point C in the Horizon for an accidental Point, to which all the Lines of that and the opposite Side must be drawn: Thus we see that A and D are drawn to the same Point C. 'Tis true each Plan placed irregularly should have two accidental Points; but they are frequently so far off in the Horizon, that 'tis a Chance you don't find them both. The present Plans have each of them one; as A B has C; and A D, the other Side, would have another, if our Paper were broad enough: E F gives G, and I H gives K. As to the little Squares 1, 2, 3, 4, they are the Plans of the Feet of the same Chairs, and may be made broader and narrower at Pleasure.

Proceed then to erect Perpendiculars from all the Angles of the Plan, and on the Side add a Line of Elevation, M N, whereon to lay the Dimensions of the cross Pieces; as O, for the lower Bars; P for the Bars of the Seat; and Q, for the Backs of the Chairs. Things thus disposed, from the Angles of the Plan draw Parallels to the Base Line, as far as the Line of Elevation, and in the Points of Intersection erect Perpendiculars: These will give the Dimensions, as already observed of the former Figures.

All the Lines of the Sides are to be drawn to the accidental Point of the Plan: Thus, in the middle Chair, all the Sides are drawn to the Point G, which is the Point of the Plan: As appears from the Figure.

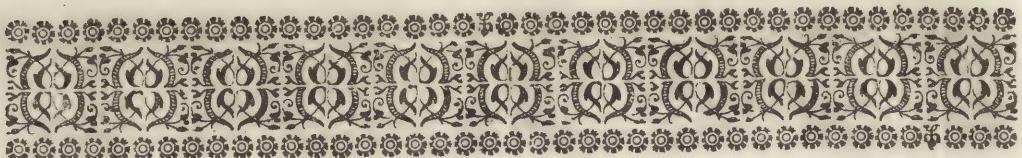
PRACTICAL

102



102

D d



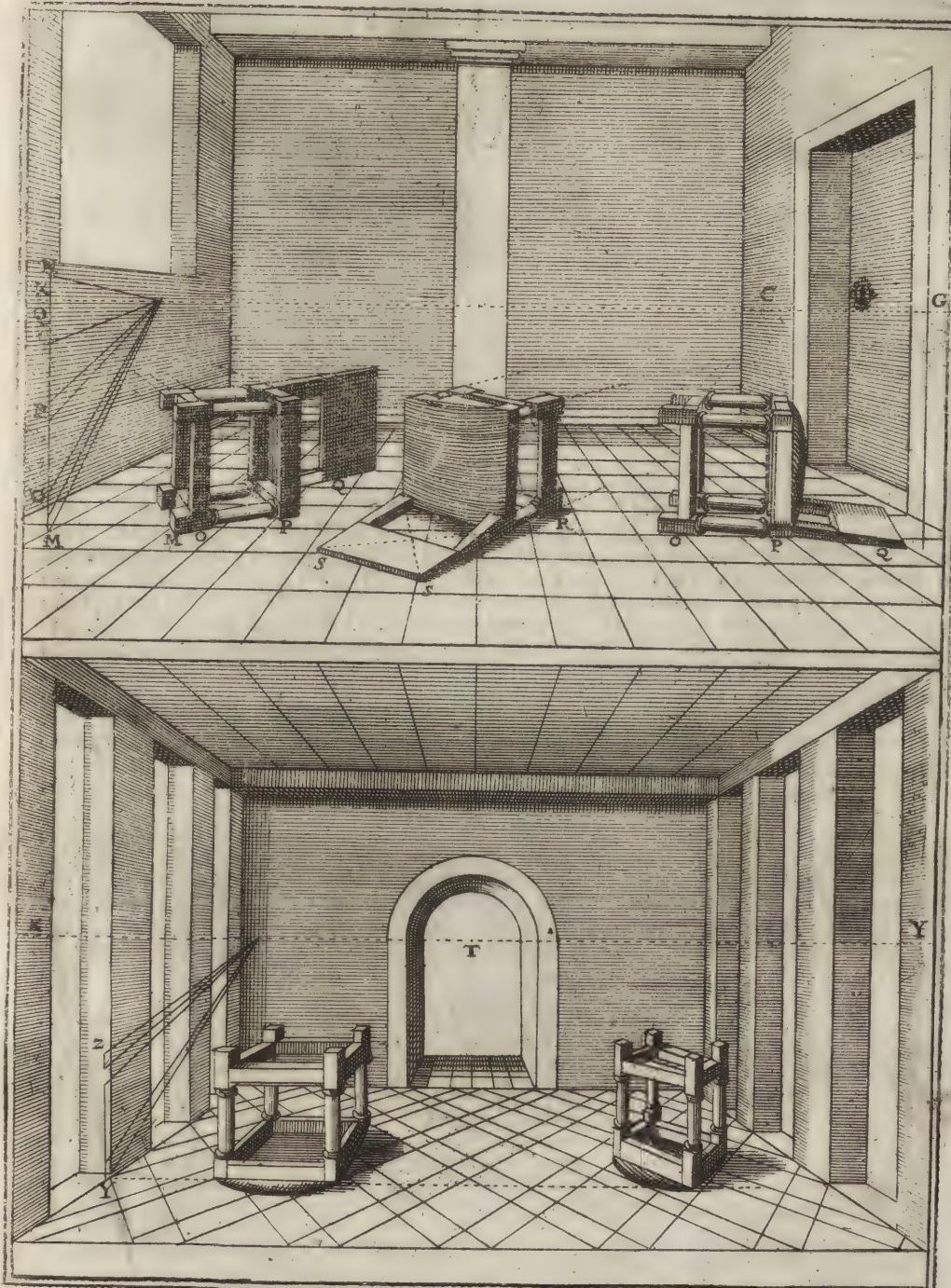
MOVEABLES *laid or tumbled on the Ground.*

FR OM the same Plan of Chairs standing on their Feet, it is easy to form these, which are laid on the Ground.

From the several Angles of the Plan erect Perpendiculars, and give the Side on the Ground the same Dimensions as that bore up above it. For Example, having erected Perpendiculars from the Angles, you'll have the Breadth M in the Chair laid on its Side, which is drawn to the Point K: This Measure M, being doubled, gives O for the Bar at the Bottom of the Chair; and the Perpendiculars raised from the Plan, give the Bar of the Seat P: From which Points, Lines drawn to K, will cut the other Perpendiculars of the Front in the Places required to shew the same Bars on all the Sides they are visible on. As to the Height of the Back of the Chair, make it the same with the Height of the Seat; but for the Back of that in the Middle, you are to draw a double Diagonal, and observe where it cuts the Rays, or Sides, R.S. The rest is obvious.

The two other Figures underneath, with their Feet aloft, are easily performed: One of them is drawn to the Point of Sight T, the other to the Point of Distance V X. The Line of Elevation is Y Z.

The Method of raising them is the same as for those upon their Feet: That is, Perpendiculars must be raised from the Angles of the Plan; and from the same Angles, Lines be drawn to the Line of Elevation: By which you will obtain the Dimensions of each of the upright Parts, and the Places of the cross Parts both of Top and Bottom.



103

D d 2



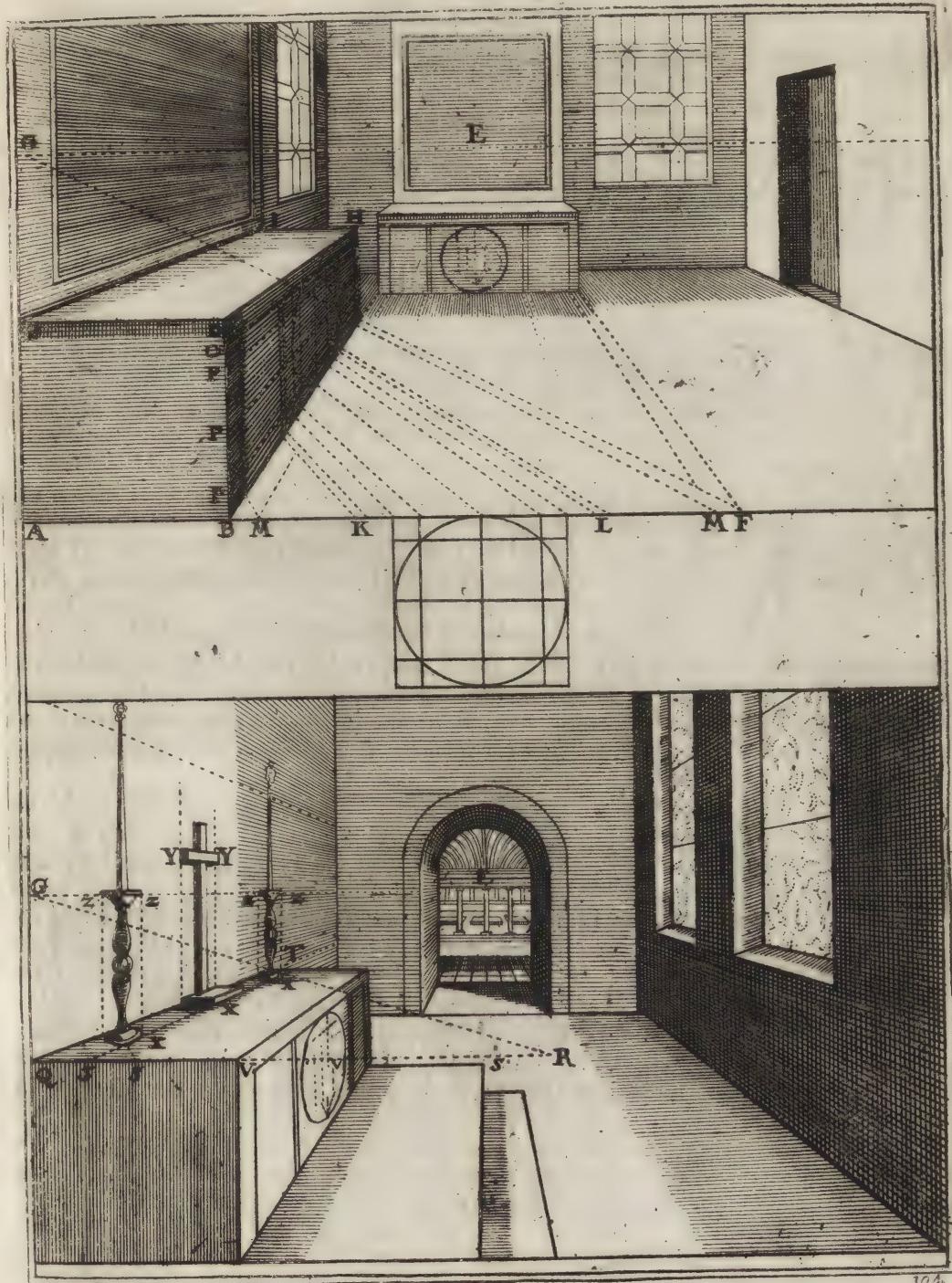
ALTARS in Perspective.

THE Method for Altars is the same as for Frames of long Tables. All there is farther in the former is the Circle in the Middle, the Edges of the Cloth and the Laces: Of each whereof in its Place.

First for the *Altar*, here viewed in Front, there is but little Difficulty; for having adjusted its Height and Length, there remains nothing but to draw Lines from all the Points on the Base Line to the Point of Sight E; and from the Intersections those Lines make with the Bottom of the Altar, erect Perpendiculars. As to the Circle in the Middle it is struck with Compasses: The rest is obvious.

For a *Side Altar* set the intended Breadth and Height in the Place where you would have it begin; as the Breadth A B, and the Height B D in the Figure. Then, from B, D, and C, draw Lines to the Point of Sight E: and since B F is the Length of the Front Altar, and we would make this equal thereto, from the Point F, draw a Line to the Point of Distance G, and observe where it intersects the Ray BC; and from the Point of Intersection raise a little Perpendicular to touch the Ray D in the Point H. Then drawing a little Parallel from H, it will give the Point I in the Ray C; and by such Means you will have the Top of the Altar, C D H I. For the two Ornaments that are on each Side the Circle, they are found on the Ray B E, by drawing Lines thence to the Point of Distance G. M gives the Breadth of the Border of the Altar Cloth. Now taking the Measure B M, set it off from D to O, for the Breadth of the Cloth at the Top. As to the Circle, we need not repeat what has been already said of the Method of putting it in Perspective. We shall only here observe, that Lines must be drawn from all the Divisions thereof to the Point of Distance G; and in the Intersections with the Ray B, Perpendiculars to be raised. Then, the same Dimensions to be taken and set off between B and O; as P P P. And from all those Points Lines to be drawn to the Point of Sight E; observing where they cut the occult Perpendiculars, and connecting the Points with a crooked Line, which gives the Circle in Perspective. The Method of diminishing would be the same, if in Lieu of Laces and a Circle there were an Embroidery.

In the Figure underneath the same Altar is shewn free of Lines, and Points, and farther adorned with a Crucifix and two Candlesticks. In order to this, the Corner Line of the Altar, Q R, must be prolonged. Then, from the Point of Distance G, a Line to be drawn thro' the Corner of the Altar T, and continued till it cut Q R; and the Line Q R will be the Length of the Altar, equal to B F in the first Figure. Hereon must the Dimensions of the Cross and the Candlesticks be laid; *e. gr.* V for the Cross and S S, &c. for the Candlesticks. From all the Points S and V, Lines to be then drawn to the Point of Distance G, and through their Intersections with the Ray Q E, little Parallels to be drawn; which cutting the Ray S E, give Squares upon the Altar, X X, &c. for the Crucifix, and Candlesticks. This Square must be left for the Foot of the Crucifix; and from the Middle of the Square, the Crucifix is to be raised. For the Proportions of the Arms of the Crucifix, erect occult Perpendiculars from the Angles of the Square, as here Y Y; and draw Lines to the Point of Sight E, for the Candlesticks. Then turn the Squares, for their Feet, into Circles, and observe where they intersect the Diagonal: For Perpendiculars erected from the Points of Intersection, give the Breadth of the Basins or Stands; and Lines drawn to the Point of Sight, the Height. Lastly, from the Middle of the Foot erect a Perpendicular for the Body of the Candlestick, and the Taper therein, which is to be made high or low at Pleasure. To proportion them, draw a Line from the Top of the first to the Point of Sight E. The rest as already said. The Figure will call to mind the Methods.





SHOPS in Perspective.

T R A D E S M E N S Shops are usually encompassed with Shelves, Boxes, or Drawers, wherein their Goods are disposed.

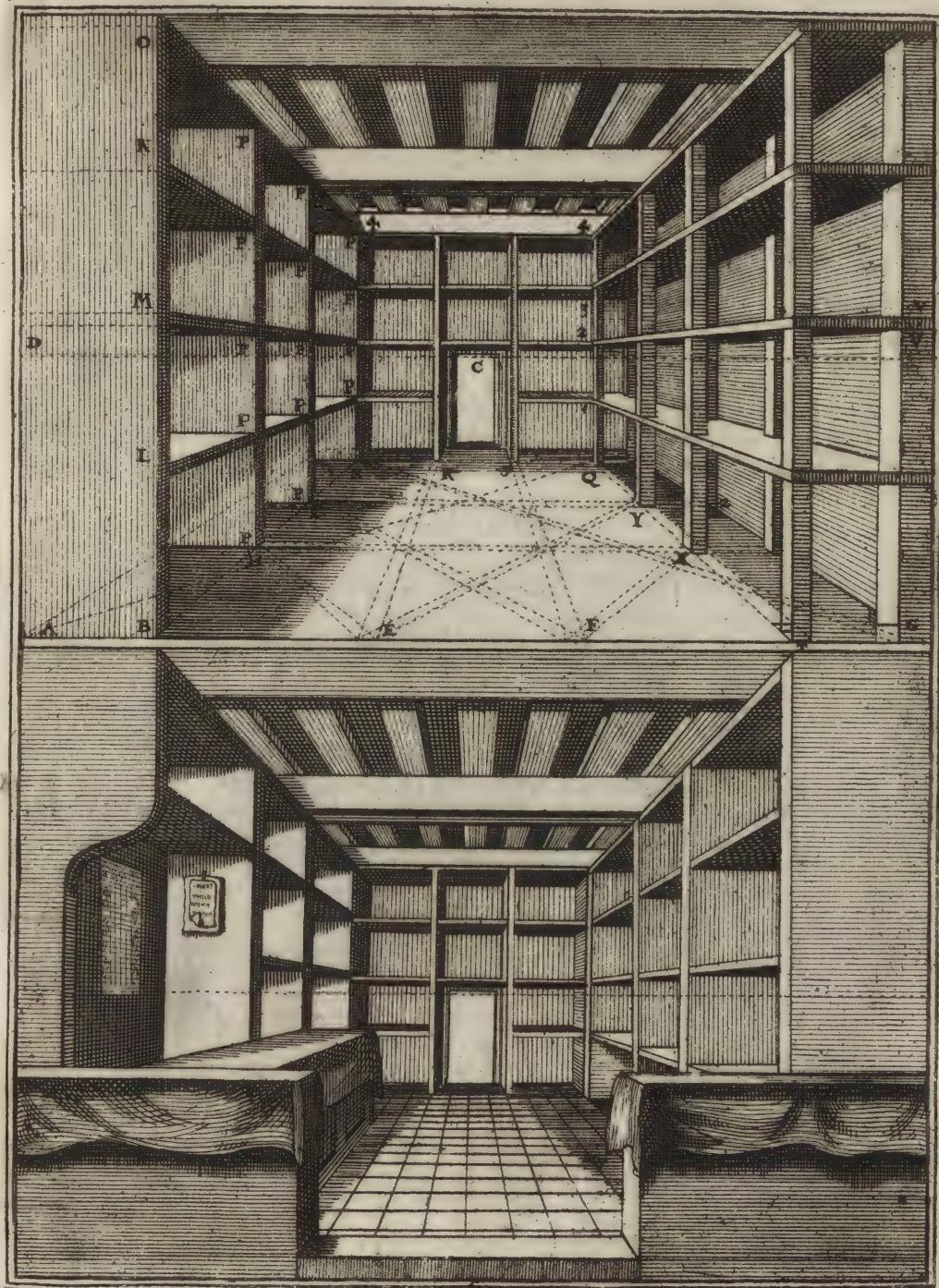
The Rule for designing Boxes, or Shelves, is much the same as that already laid down for Doors, and Windows; *e. gr.* in Lieu of the Thickness of the Wall used in making a Window, you are here to put the Board AB, and from the Point B, to draw a Line to the Point of Sight, C. Then, for the Bottoms of the Boxes; having laid down the Distances, or Proportions of the Boards, &c. in E, F, G, from these Points draw Lines to the Points of Distance D. These make Intersections, H, I, K, with the Ray B: From which Intersections, Perpendiculares are to be raised.

For the cross Boards, set any Number thereof at Pleasure, on AB, or only on the first Perpendicular BO; such are, here, L, M, N, O: From all which draw Lines to the Point of Sight C, and their Intersections with the Perpendiculares, in the Points P, P, &c. give the Boxes. So that nothing remains but to draw little Parallels to the Base Line; which give the Corner of the Box, separating the Side from the Top and Bottom.

As to the *Front Boxes*, there only needs to draw Rays from the Points or Measures, and in their Intersections with the Line QS, to erect Perpendiculares R and S. The cross Pieces are had, by drawing Parallels from all the Divisions on the Perpendicular K; as are, here, P₁, P₂, P₃, P₄.

As to the Boxes on the opposite Side, where there are square upright Posts to sustain the Shelves, their Width is had by drawing Lines from the Measures TG to the Point of Sight C. And to get their Plan, or Square, Lines are to be drawn from the Measures AEF to the Point of Distance V, which give the Intersections XYQ on the Ray TC. Through these Intersections little Parallels must be drawn till they cut the Ray TG in Z; and from the Angles of these little Squares Perpendiculares are to be erected, which give the upright Posts, as in the Figure.

The Figure underneath shews a Shop quite fitted up, and ready to receive Goods of any Sort: For a Bookseller, it must be stocked with Books; for an Apothecary, with Drawers and Gallipots; for a Draper, with Pieces of Cloth, Stuff, &c.





BUILDINGS view'd on the Outside.

HAVING now considered every Thing relating to the Insides of Buildings, Churches, Houses, &c. we proceed to give Rules for the Out-sides.

Many of the Methods already laid down for the Insides may likewise serve for the Out-sides: Thus the Method for Doors and Windows in any Part of a Wall is itself sufficient for the Out-sides of all Kinds of Buildings; inasmuch as the most of what appears of the Outside of a Building is Doors and Windows. In Case it be enrich'd with Orders of Columns, &c. those, too, we have taught to manage.

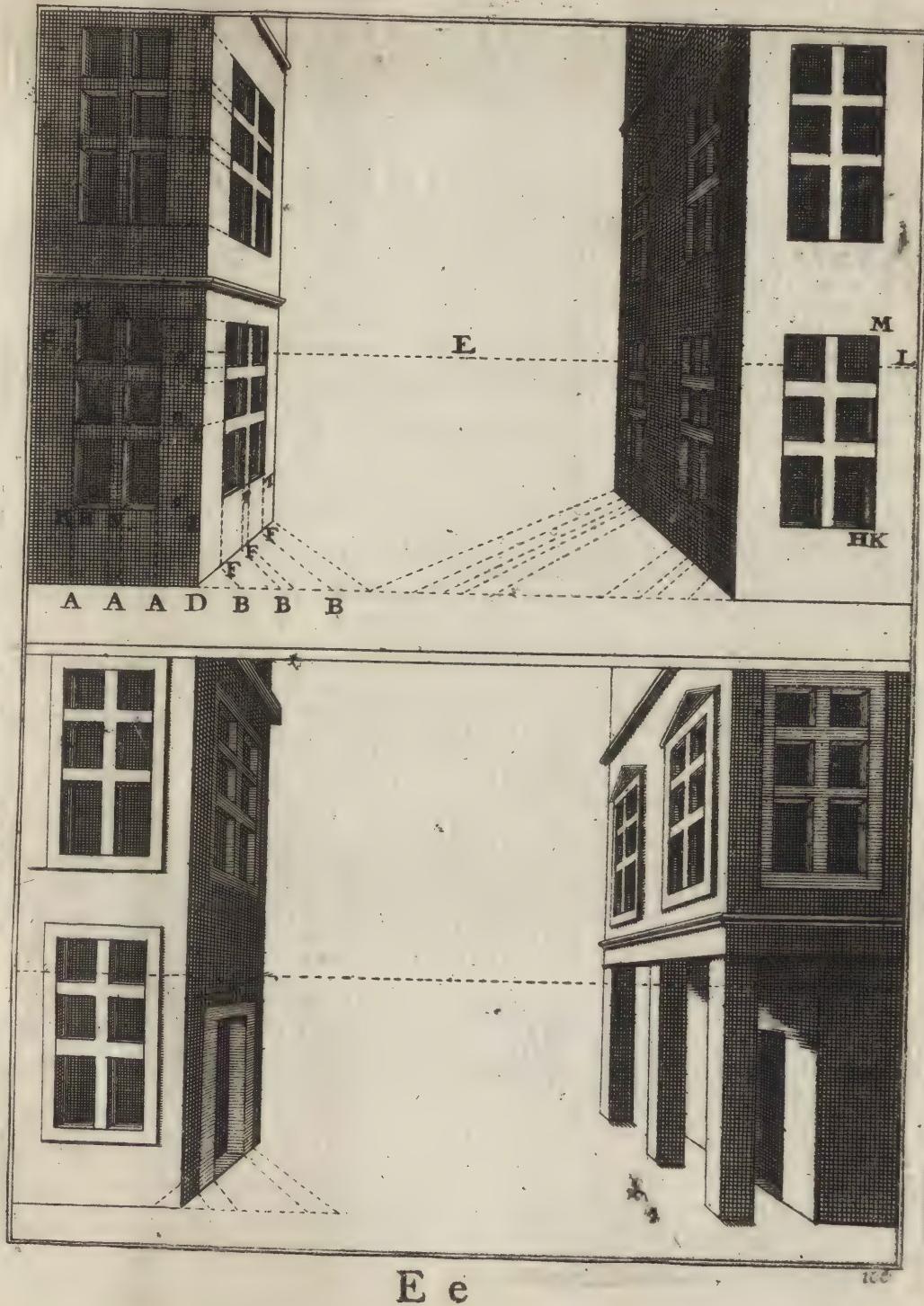
If there be Windows in Front, as A, and 'tis desired to have others in the same Proportions on another Side, the Proportions AAA must be transfer'd to the Base Line, as here to BBB, and Lines be drawn thence to the Point of Distance C: And in the Points FFF, where they intersect the Ray DE, Perpendiculars to be raised for the *Uprights* in the Window.

For the *cross Pieces*; those in the Front Window must be continued to the Perpendicular D, by which Means you will have the Points II; from which Lines are to be drawn to the Point of Sight E, which cutting the Perpendiculars F, give the cross Bars in the Side-window.

If the Number of Windows were much greater nothing farther would be required but to continue their Rays, in order to make the Measure and Height of the cross Pieces the same in all. An Instance of which we have in the House on the other Side, which has two Windows from the same Rays. As to the Breadth, or Thickness of the Posts and cross Bars of Windows in Front, it must be set on one of the Travers, as here on K H; and from the Corner of the Window K, a Line be drawn to the Point of Sight E; and from the Point H, another to the Point of Distance C, for the Window A, and to the Point of Distance L, for the Window on the other Side; and in the Point, where those two last Lines intersect, a Perpendicular, HM, must be raised. Then, from all the Corners of the Window Lines to be drawn to the Point of Sight, and from the Points QQ, &c. where they intersect the Perpendicular HM, Parallels must be drawn to give the Thicknesses of the cross Bars. The Thickness of the middle Post, N, will be had by drawing a Line from the Corner, N, to the Point of Sight; and in the Points QQ, where it cuts the Thicknesses of the cross Bars, erecting Perpendiculars QR, Q R.

To fix the Thickness of the Windows on the other Side, it must be set in the Corner of the Wall, on the Perpendicular D, as the Distance IO; and from the Points OO, &c. Lines must be drawn to the Point of Sight E. Lastly, little Parallels to be drawn from all the Corners of the Windows, as S, T; which, intersecting the Ray O, give the Thickness in the Point S. These Rules may serve for all Kinds of Windows, both high and low.

In the Figure underneath is shewn a Door diminished according to the Rules delivered heretofore. As, in Effect, every Thing belonging thereto is very easily understood, and readily practis'd, on some or other of the preceding Methods.





ROOFS of Houses in Perspective.

ROOF S are made of different Heights according to their Materials. Those of *Slate* are the most upright of all. Their usual Measure is an equilateral Triangle; *i. e.* their Slope, or the Declivity of the Roof, is equal to the Width of the House. Thus, in the little Figure at the Bottom of the present Plate, C A, or C B, is equal to A B. Others make the Breadth A B equal to the Punchion, or middle Top, D C, which is higher. But that Practice is much less usual than the former. For *flat Tiles*, we only make the Roof two thirds of the Height of those of *Slate*, or of the Width of the House; as in A E B: For *Thatch*, the Height is usually but half the Width: And for *Pan-tiles*, only one third; as A g B.

Before we go any farther it is to be observ'd, that what we call *Punchion*, or middle Top, is a Timber rais'd perpendicularly on the Beams that sustain the Ridge, and wherein the Rafters are all jointed. *Rafters* are the Pieces of Wood which form the Declivity of the Roof, as H I. The other Pieces in the Corners, which go to the middle Top, are called *Stays*, and are usually longer than Rafters, as H K.

There are three Kinds of Roofs in use; Pavilions, Pinnacles, and Pent-house-form. The first have four Sides, the second only two, and the last but one.

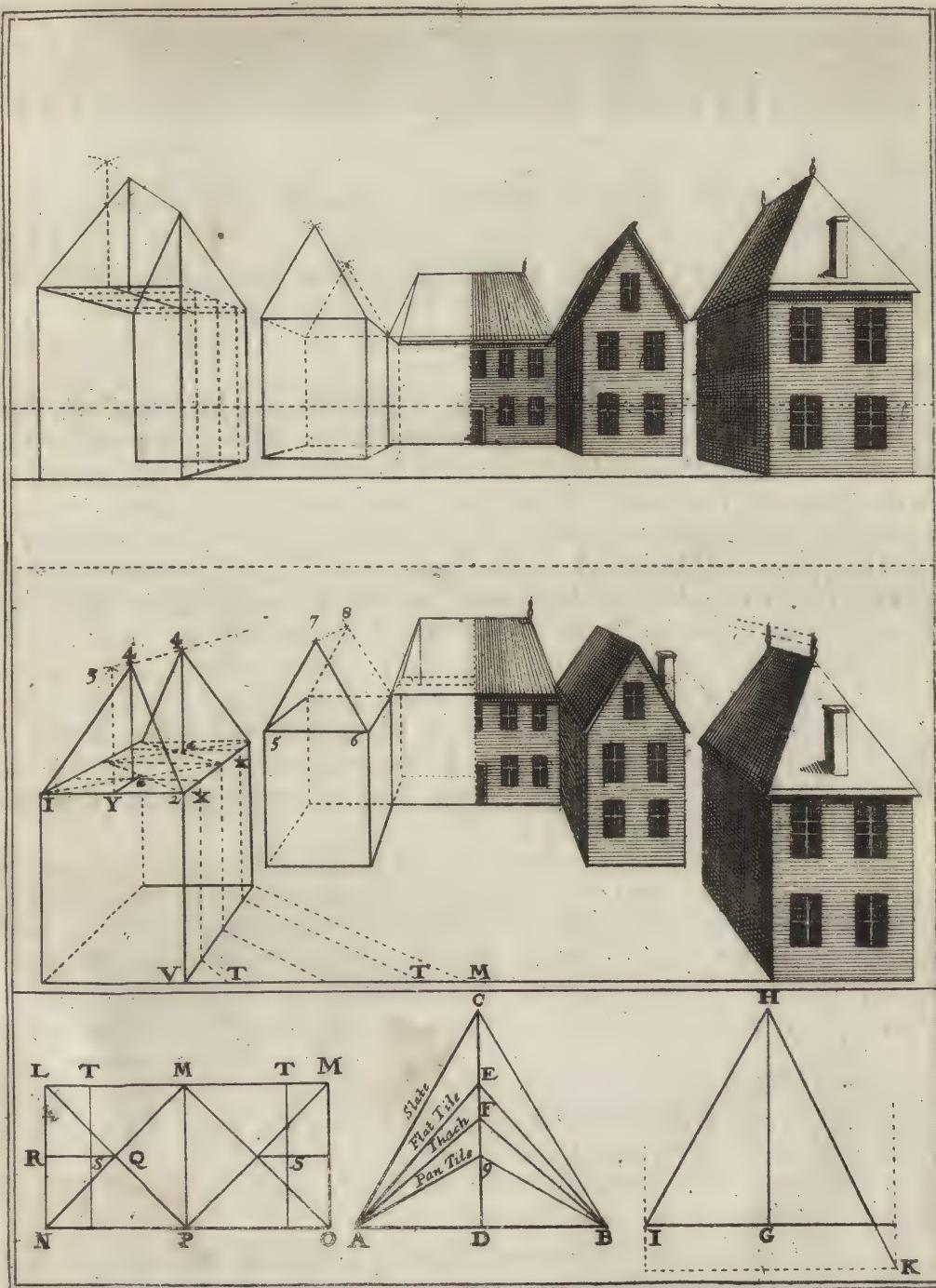
To put a Pavilion, or Turret, in Perspective, the Place of the middle Top must be known, that the Stays may be drawn to the same. For this reason it was that I made the geometrical Plan L M N O; to shew, that a Square, L M N P, is to be made of the Breadth of the House L N, and two Diagonals drawn through the same, intersecting in Q. Some put the Punchion in Q, but that advances it too far, and renders the Declivity of the End too squat. It has a much better Grace when more upright. With this View, it should be approach'd towards the Wall L N a third part of the Distance Q R, which will bring it to the Point S; from which Point a Perpendicular, S, must be drawn upon the Line N P. Then, the Measures L T and T M to be set on the Base-Lines, and Lines drawn from them to the Point of Distance, which is here more remote than usual; and from the Points, wherein they intersect the Ray V, Perpendiculars to be erected to the Top of the Wall, which will give the Points X X; from which, Parallels to the Base-line are to be drawn as far as the other Ray I. Then, from the Middle of the Wall Y, a Line to be drawn to the Point of Sight, cutting the Parallels in the Points Z, Z, &c. from which Points the Punchions are to be rais'd. To give them the proper Height regard must be had to the Materials intended for the Covering, and the Height be adjusted thereby, according to the Proportions already fix'd. Thus, suppose the Covering, *Slate*, an equilateral Triangle, 1, 2, 3, must be made of the Breadth of the Wall; and from 3, a Line be drawn to the Point of Sight, cutting the Punchions in the Point 4. To which Point, Lines being drawn from the Corners of the House, will give the Form of the Pavilion.

For *Pinnacle Roofs* there need not so much ado. You are only to make an equilateral Triangle, 5, 6, 7, of the Breadth of the Wall 5, 6, and the like for the other End of the Wall, which will give you the Point 8. Then joining 7 and 8, you will have the Form and Measure of the Roof.

The Figures on the other Side shew the same Thing unembarrass'd with Lines. The Projecture standing beyond the Roof is made at Discretion.

The Front-house is cover'd with a Pavilion, perform'd after the same manner as that on the Side.

In the present Figure, where the Letters are, the Horizon is placed very high, to shew the Tops of the Houses, and render the Practice more easy, and conceivable. But, as it is not often such a Case happens, I have added the other Figure at the Top, wherein the Horizon is as low as usual: Tho' the Rule in itself is the same as that already deliver'd.





Sequel of the Roofs, in Perspective.

IN the preceding Figure the *Pinnacle Roofs* are viewed in Front, and their Height, where covered with Slate, fixed to that of an equilateral Triangle. Where the Covering is Thatch, or Tiles, the Heights are laid down on the Figure underneath.

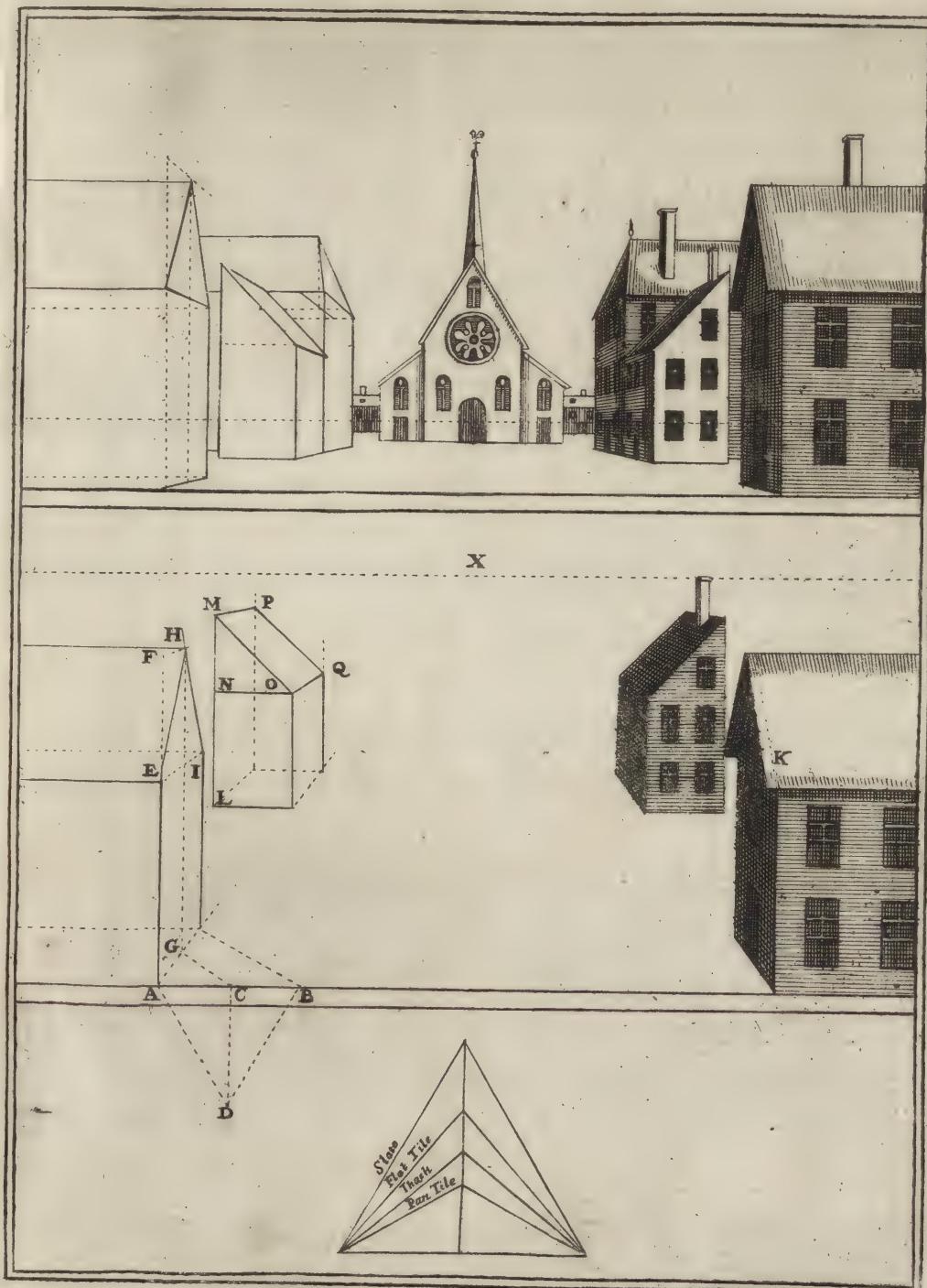
Now, to make these latter Roofs with Returns, the Width of the Bottom of the House must be set on the Base Line, as here A B; and of this Width a Triangle is to be formed with the other Dimensions, according to the Form of the Roof. The present is an equilateral Triangle, whereof C D is the Height intended to be set perpendicularly on the Corner of the House, at the Height of the Wall, as here E F. Then the Breadth of the House is to be laid down in C, which is the Middle of A B; and from thence a Line to be drawn to the Point of Distance; and in the Point G, where it intersects the Ray A, a Perpendicular must be raised. Lastly, from F, a Line to be drawn to the Point of Sight X; the Intersection whereof with the Perpendicular H, will be the Point, or Tip of the Pinnacle; to which Lines must be drawn from the Corners of the House, E I. If you would have Eaves, they are easily added: As is seen in the Figure on the other Side, D.

For *Pentices*, you have only to draw a Line for the Height of the Roof, as here the Line L M, and give it any Declivity at Pleasure. In the present, the Height of the Roof M N, is the same with the Breadth of the Building, N O. If then, from the Points M O, Lines be drawn to the Point of Sight X, the Perpendicular of the Depth will be cut in the Points P and Q; which being connected by a right Line will form the Roof. The Figures on the opposite Side shew Houses covered after such Manners.

These a Top are only intended to shew that the same Rule is to be observed, tho' the Horizons be changed.

A Church is seen in the Middle, which is covered or roofed with Pinnacles; and the Wings with Pentices.

There is also a Pavilion viewed end-wise; mention whereof has been made in the preceding Page.





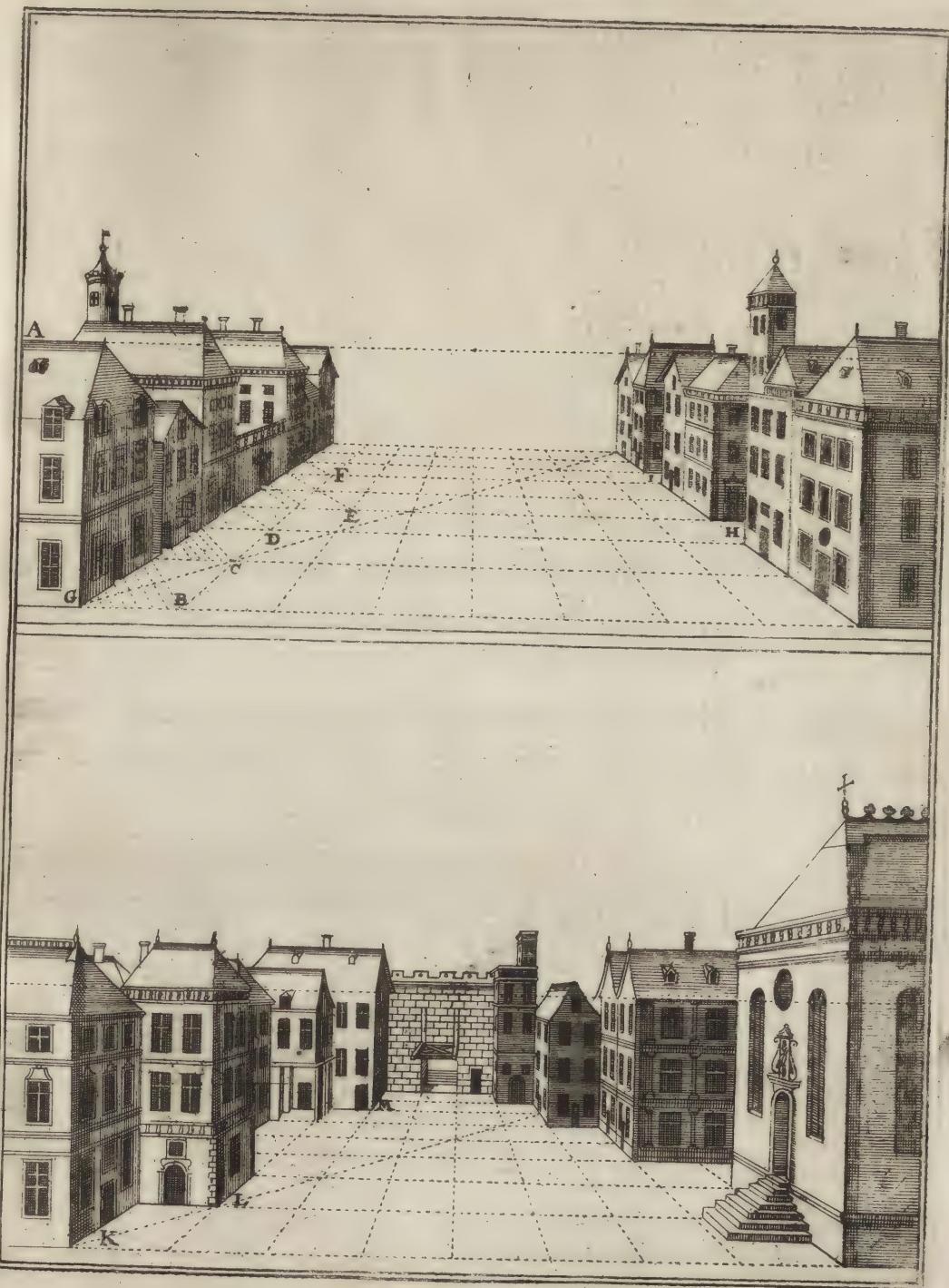
To put a Street in Perspective.

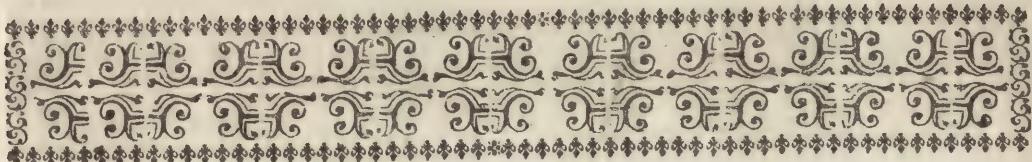
A Bare Sight of the Figure must suffice to shew the Method, which is exceeding easy. All you have to do is to make a Plan of simple Squares, the common way ; and to take one, or two, or three of the Squares for the Breadth or Length of each House ; and on such Breadth, &c. to set off the Measures of the Doors, and Windows ; and to get the Diminutions by drawing Lines from the several Measures to the Point of Distance ; as here from B C D E and F.

The first Angle of each House may serve for a Line of Elevation, as the Angle G in the first House. As to the Roofs, we have already said how they are to be manag'd.

If you require any cross Streets, one, two, or three Squares are to be left vacant, and nothing upon them, as are here H and I.

The Figure underneath is to shew, that where Houses are to be made advance, or fall back, you have only to put their Elevations forwarder or backwarder on the Plan of Squares. Thus L advances a Square farther than K, and M farther than L ; and so of the rest.





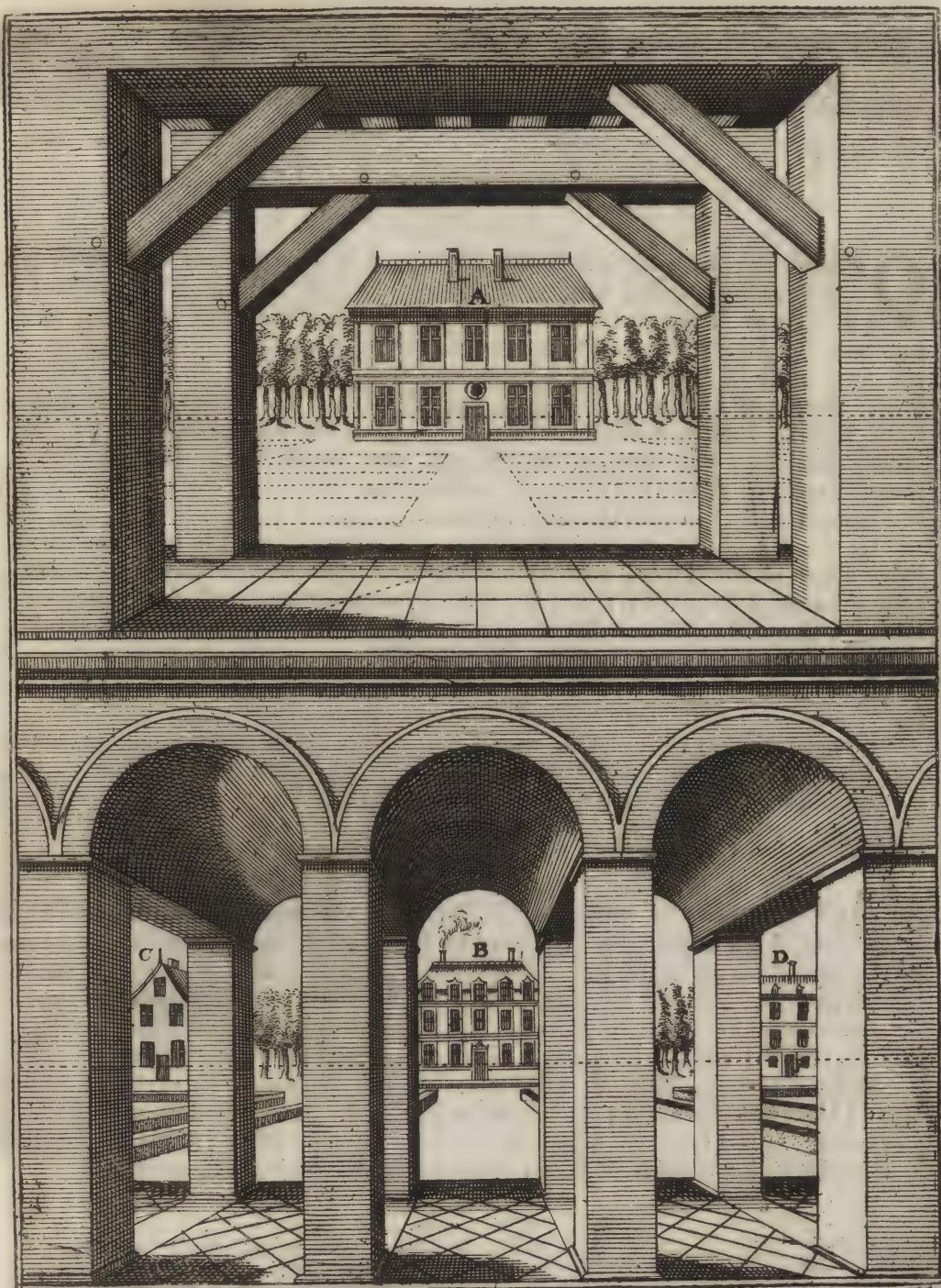
*That remote Objects do not shew
their Thickness.*

IT must be here remember'd, that Objects near the Horizon, that is, such as are extremely remote, are not to shew any Thickness when view'd in Front. Thus, for Example, the Houses A, B, C, D, should not have any Thicknesses of the Windows, Doors, &c. but only mere Lines. The Reason is, that the visual Rays proceeding from the front Parts of the Object become united in the Eye with the collateral ones.

I should have given a strict Demonstration hereof, had I apprehended it any way necessary. But as I don't see of what use it would be, and as I stand engag'd from the Beginning of the Book not to enter into such Demonstrations, by reason I suppose I have to do with People who are but indifferently prepar'd to understand them, I decline it.

PRACTICAL.

110



F f



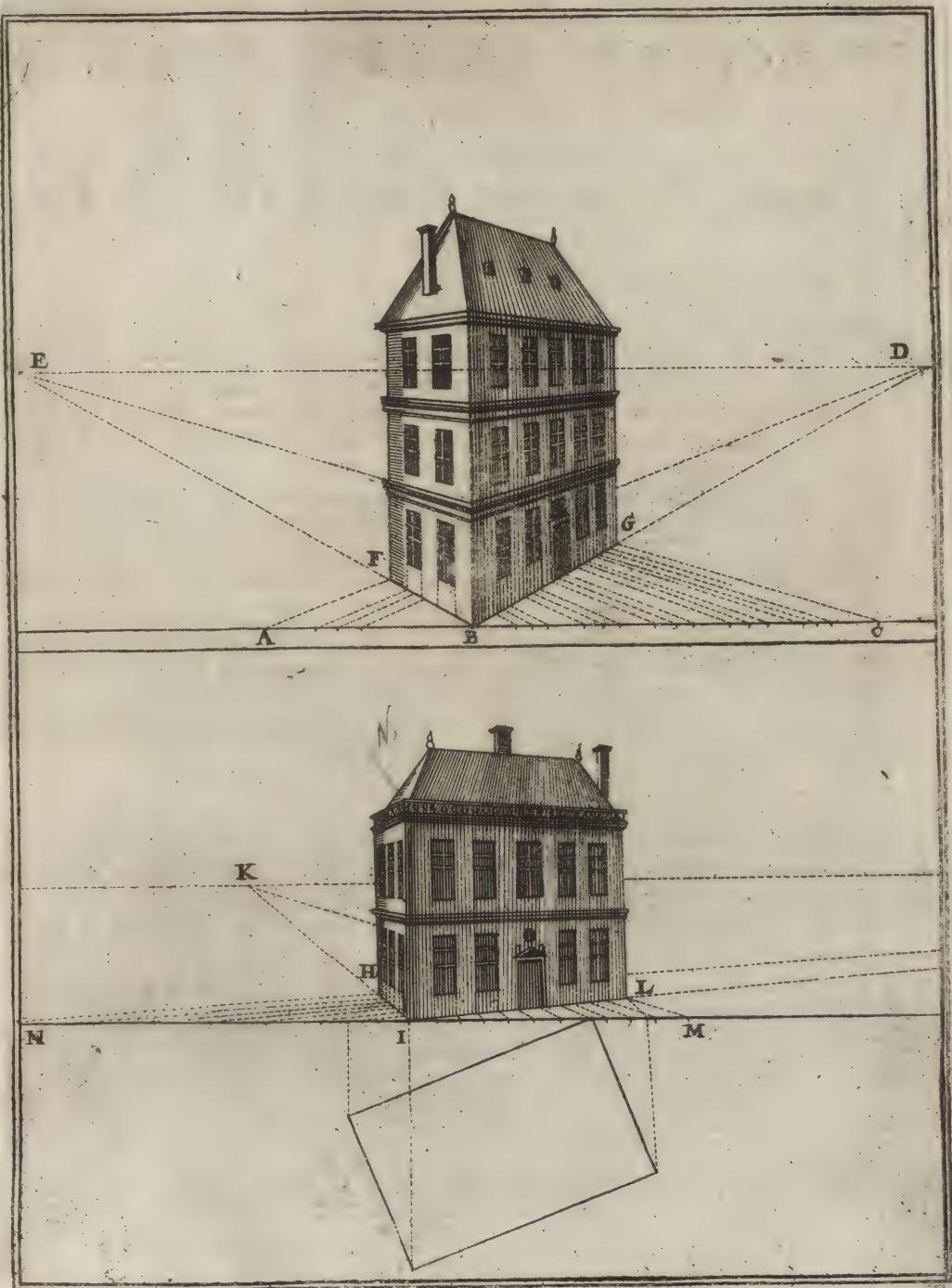
BUILDINGS viewed by the Angle.

OF these two Building seen Angle-wise the first is performed after the Manner already delivered for Squares viewed the same Way, and Elevations of other Things in Side-views. However, to save the Trouble of recurring to the one and the other, we shall here observe, that to perform such Buildings the Measures must be set on the Base Line, and from each of them, Lines be drawn to the Point of Distance, and from the Points of Intersection Perpendiculars to be raised: The first Angle serving for a Line of Elevation. Thus, in the present Building, the Breadth being A B, and the Length, B C, double its Breadth; from A and B, Lines are to be drawn to the Point of Distance D; and from B and C to the Point of Distance E; and from the Intersections B F and G, Perpendiculars to be raised for the Corners of the House. As to the Dimensions of the Doors and Windows, they must be laid down on the Base Line between A B and B C; and Lines be drawn from them all, to the Points of Distance D and E. Then, observing where B D or B E are intersected thereby, raise the Posts of the Windows therein. The Perpendicular of the first Angle B serving for a Line of Elevation, will give the cross Pieces, and the Height of the Windows. The rest is obvious.

As to the Figure underneath; the Method is the same as for Chairs placed irregularly; *i. e.* having made the Plan, put it in Perspective as irregular Objects are put: Then, laying a Ruler along each Side of the Plan, observe where it cuts the Horizon, and marking the Point, draw Lines thereto from each Part of that Side of the Building. Every Side or Face of a Building has its particular Point. Thus the Plan being put in Perspective, the Side, H I, gives the Point K on the Horizon, to which all the Rays on that Side must be drawn. The other Side, I L, should likewise have its Point; but for want of Paper-room, we could not here express it. These two Points found, a Ruler must be laid thereon, and an occult Line drawn over the other Side of the Building parallel upon the Plan to that which gave the Point in the Horizon, and continued to the Base Line; as from R through L to M; and from the other Point continue an occult Line through H to N. Then setting the Number of Windows of the Side H I, between N and I; and between I and M, setting the Number of Windows on the Side I L, draw Lines from all these Points, or Measures on the Base Line to the Points in the Horizon: And proceed as in the Figure above.

PRACTICAL

III



Ff 2



To put Walks, with Rows of Trees, in Perspective.

THO' the preceding Rules might furnish sufficient Instructions for putting Walks with Trees in Perspective; we have judged it not amiss to add a particular Rule which may render the Method still more easy.

If only a single Row of Trees on each Side be required, there is no need for making a Plan of Squares, or Checquers: What is directed in Pag. 17. will suffice.

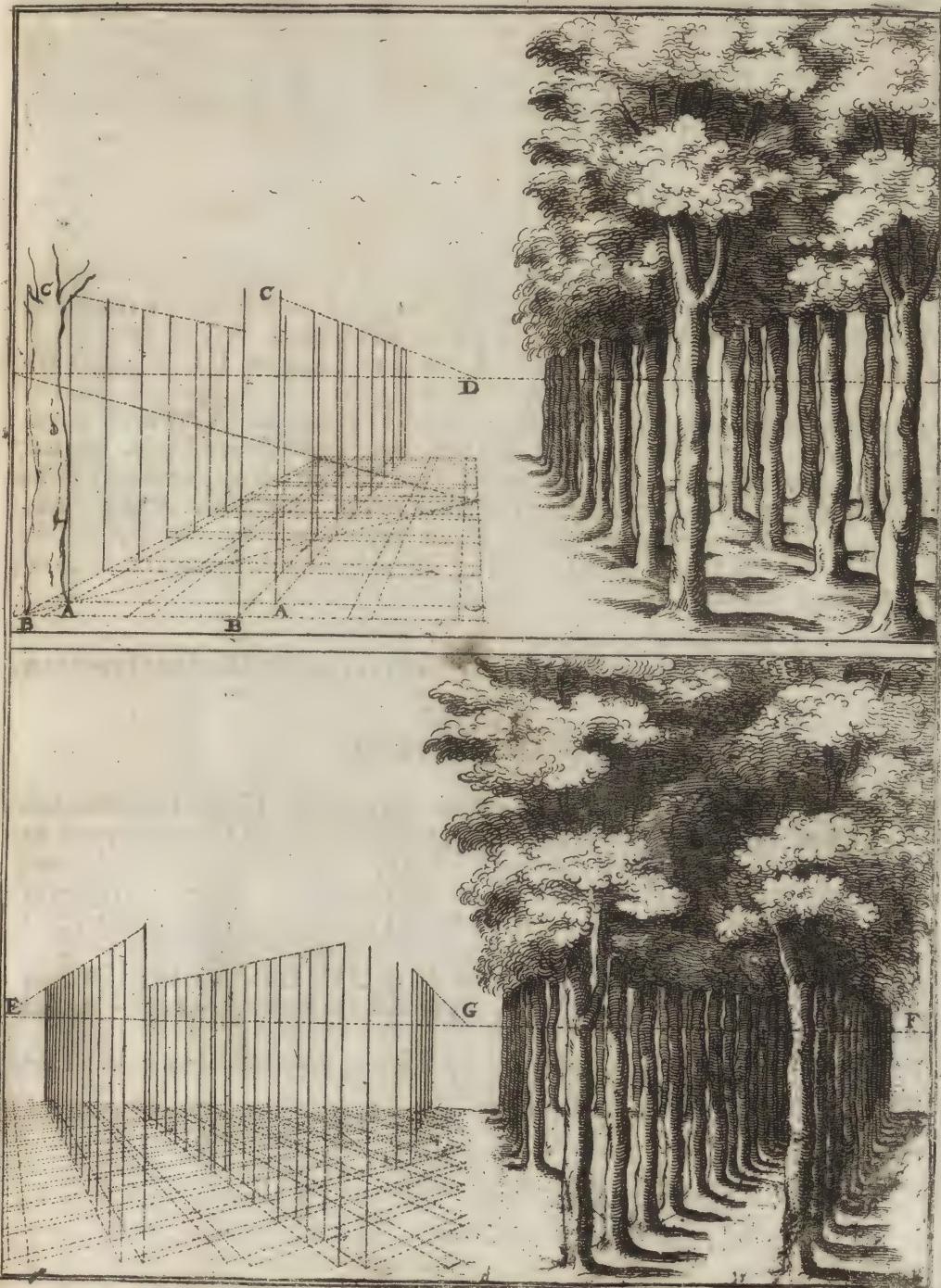
But where a Number of Walks are to be shewn, we think it adviseable to form a Plan in occult Lines, with Trees, as already taught in Pag. 31. and from the Diagonals of the little Squares formed thereby, to erect Perpendiculars, as is shewn in A B. If you desire to have the Trees farther or less apart, increase or diminish the Distances of the Squares on the Base Line.

When you have given the Stem of the first Tree its proper Height, as A C, draw a Line from C to the Point of Sight D, which Ray CD is to bound the Stems of all the other Trees. The first Tree, A B, shews that you may give them what Turn or Form you please between the two right Lines; and that they are not to be drawn with the Straightness of a Ruler.

The Figure underneath is performed as that above, all the Difference is, that the Squares of the upper are direct, or in Front; and those of the under, viewed Angle-wise: Whence the Measures on the Base Line, in the latter Case, must be all drawn to the Points of Distance E and F; Perpendiculars to be raised from the little Squares, and the rest as above.

In the same Perspective, wherein are Walks drawn to the Points of Distance, one may add others, drawn to the Points of Sight. Thus the middle Walk tends to the Point G, which is the Point of Sight; and the others to the Points E, F, which are those of Distance.







To put Gardens in Perspective.

IN the Doctrine of Plans has already been shewn the Manner of diminishing, or putting the Plan of a Garden in Perspective, by an easy Rule; supposing that you have the Plan thereof. But, as I always endeavour to avoid geometrical Plans, by Reason it takes up too much Time to make them, I have added the present Figures: Whereby it appears, that having made a Chequer, or Plan of Squares, you may take as many or as few of them as you please for the Beds of the Garden: As here, A and B have each of them three Squares every Way; the rest serving for Walks, as C C. If you would have Compartments, or Knots in the Beds, you are to use the little Squares or Divisions of each Bed; cutting them, and forming of them the Figure required; as is shewn in the Squares of A and B; and those of the other Side, D and E. The Pallisades and Arbours are cut thro' the Breadth of the Walks.

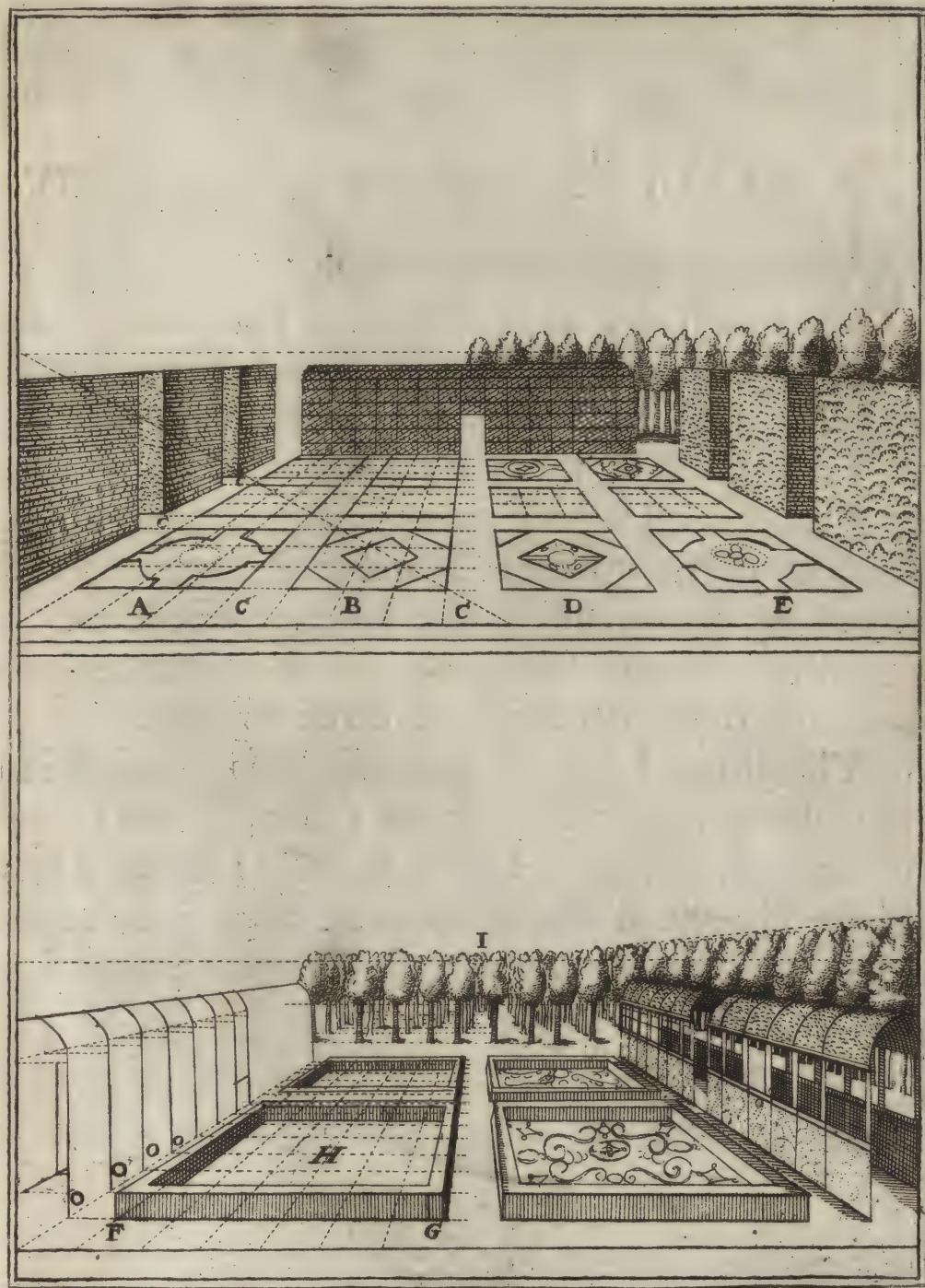


Beds with Borders.

WHEN Borders are to be given the Beds, the intended Heights and Breadths must be set on the Corner; and from those Measures, Lines be drawn to the Point of Sight. Thus, in the lower Figure, F G being the Breadth and Depth of the Borders of the Bed H, Lines must be drawn from the Angles of the little Square F and G to the Point of Sight I; and go on with the rest, as aforesaid.

For *Arbours*, upright Posts, or Perpendiculars, O O, &c. must be raised from the Angles of the Squares of the Walk. The rest as already directed for Arches viewed Side-wise, in Pag. 60.

The *Grove* in the Middle is performed by erecting Perpendiculars from all the Angles of a Chequer, &c.





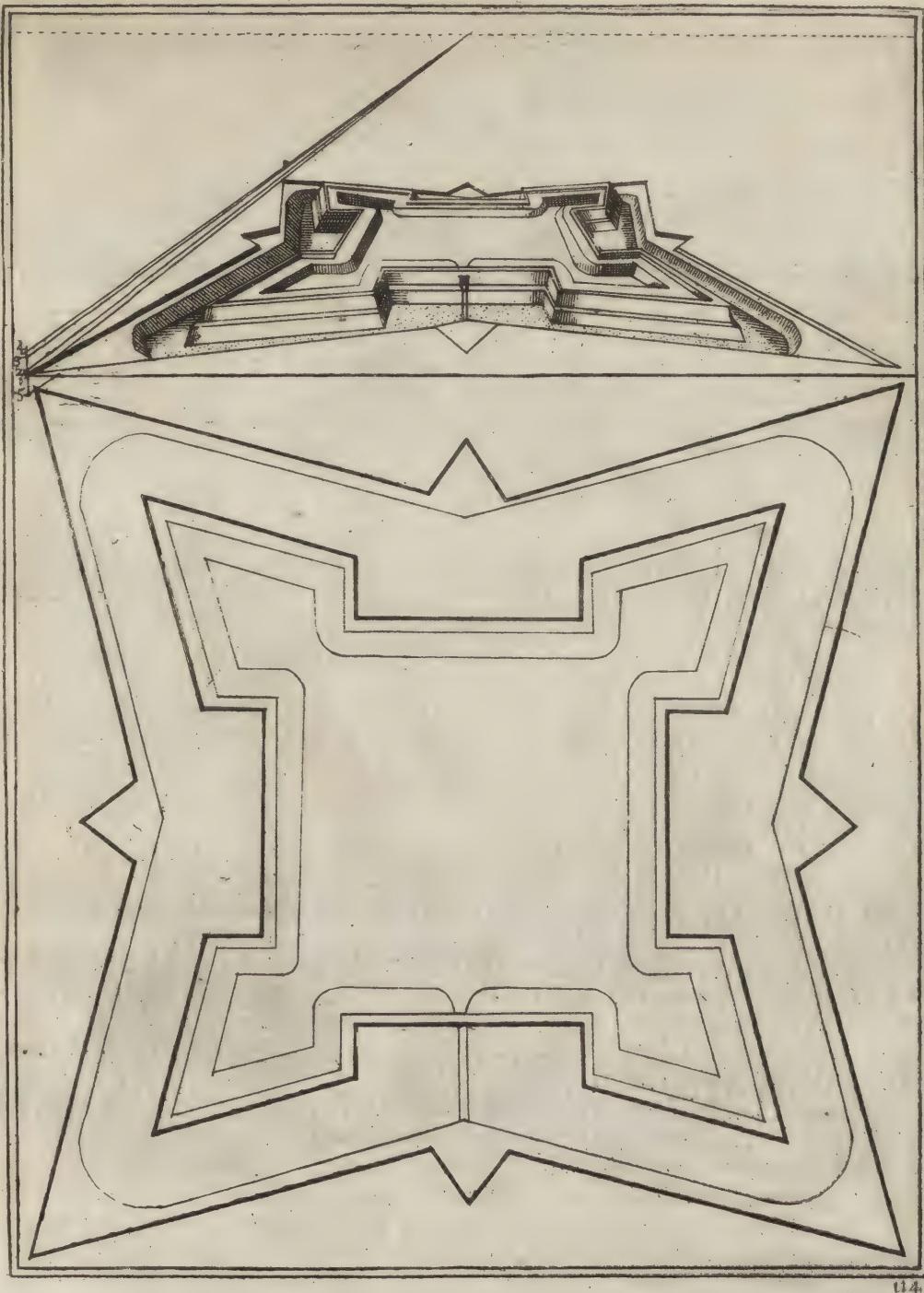
To put Fortifications *in Perspective.*

WE need not here repeat the Method of diminishing, or putting in Perspective, the Plans of all Sorts of Fortifications : What has already been said in *Pag. 39.* is clear enough.

To raise them there is no more Difficulty than in a bare Wall ; only more Time is required, by Reason of the greater Number of Angles which are to be drawn all to the Line of Elevation, to give their Heights thereon ; as has been mention'd over and over in treating of other Works.

The little Line of Elevation is divided into four Parts : The first, from 1 to 2, is the Height of the *Parapet of the covered Way* ; from 2 to 3, is the Height of the *Rampart* ; from 3 to 4, the Height of the *Parapet of the Rampart* ; and from 5 to 1, the Depth of the *Ditch*.





G g



To make Designs in Perspective.

THERE is no Master so excellent, but makes Designs of the Works he would succeed in. If this be usual in most Arts, 'tis necessary in this, by Reason of the great Number of Points, and Lines to be strictly observed, and nicely managed, without which nothing is to be done in any wise pleasing to a Person that has any Taste or Skill therein.

Since then there is a Necessity of making Designs, we are to look out for what may be assistant therein. And as every Body knows that the Length and Tediumness of such Works lyes in the drawing of Parallels and Perpendiculars, I have sought both in Authors, and in Experience, for a Method of doing the same as expeditiously as possible. The Result is, that nothing of this Kind has appeared to me worth the recommending, but the Plate and Square, which *Viator* has left us in his Writings; which are Things such People, as have Occasion to spend much Time in designing, will find a deal of Ease and Benefit from.

Tho' the Figure gives a tolerable Notion of the Thing, and the Method of using it, it may be convenient to give something more express thereon. The Plan A B C D, then, is to be perfectly on the Square, a Foot and a half long, fifteen Inches broad, and half an Inch thick. The Wood to be dry, firm, and smooth. To make it the softer, and favour the Pen, a Sheet of Paper may be stuck on it. The Square E F is a Ruler a Foot and a half long, an Inch broad, and a Quarter of an Inch thick, fitted at right Angles in another Ruler, G H, eight Inches long, one broad, and three Quarters of an Inch thick. Now to draw Lines, this last Ruler, G H, is held close to the Board A B C D, in which Case the other Ruler, E F, is certainly right, provided the Board and Ruler be exactly formed.

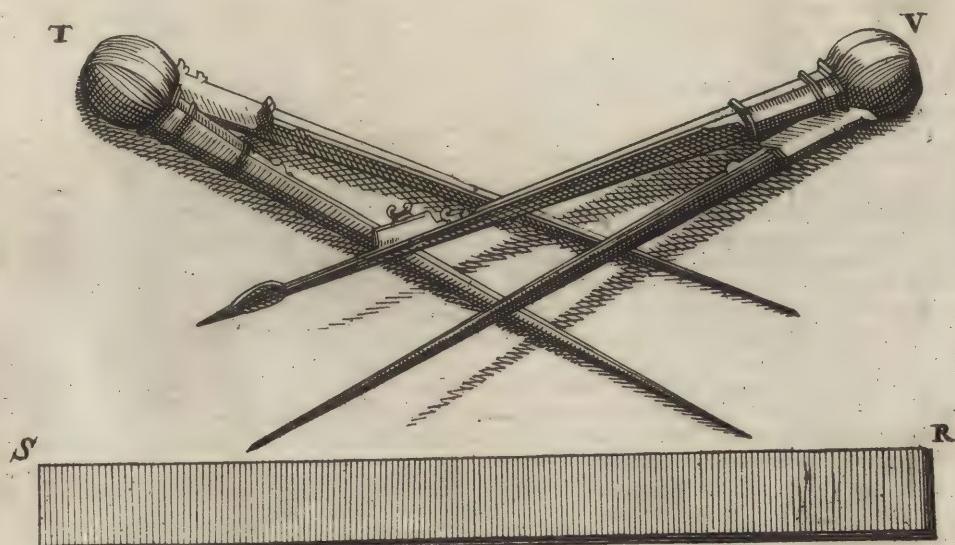
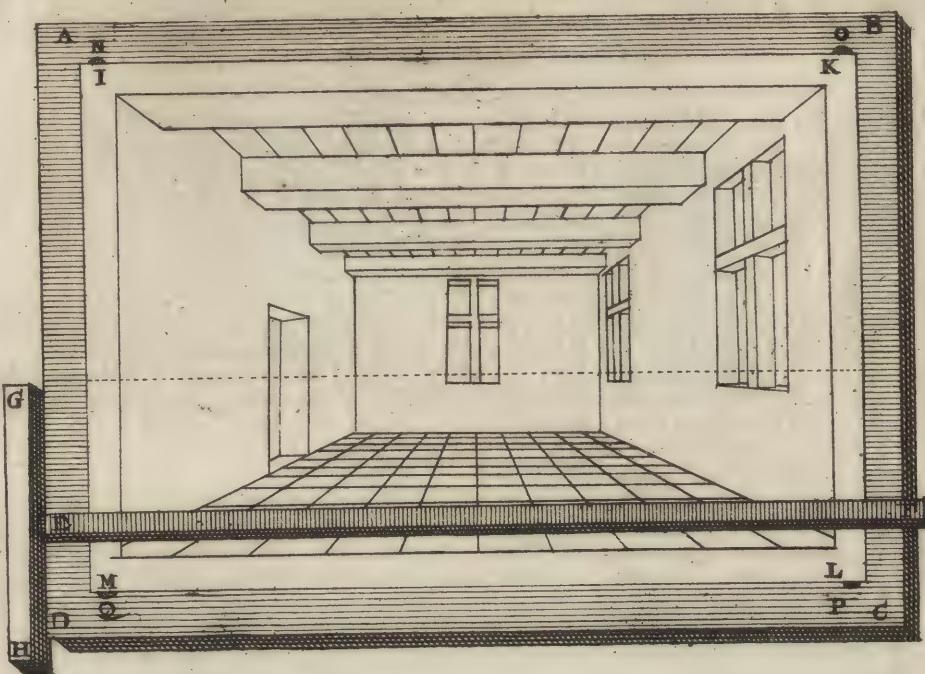
When you go to Work, fasten the Sheet of Paper, I K L M, on the Board with four little Pieces of Wax, N O P Q; then may you draw Lines from any Point, secure that they are right. And for Perpendiculars, you have only to lay the Handle, or Cross of the Ruler, G H, on the Side G D, in which Case E F will be perpendicular to C D.

For myself, I find a wonderful Ease herefrom. The Truth is, without such a Contrivance, a Man must never be without the Compasses in his Hand. All the Trouble now remaining is for the visual Rays. And for these, some use a Ruler perforated at one End, and fastened by a Needle to the Point of Sight. But this is to run into a Trouble greater than what you would avoid. The common Ruler does every whit as well.

R is a common Ruler.

T a Pair of common Compasses.

V Another Pair of Compasses, with a drawing Pen therein; for circular Lines. These are all the Instruments necessary for making of Designs in Perspective.





Reduction of Perspective Draughts out of Small into Great; and out of Great into Small.

AS Designs are made with more Ease in little than in great, 'tis but reasonable they should always be so made. This has put me on giving a Method of enlarging small Designs on the Canvas. The Method commonly used by the Painters is to divide their little Designs, and the Canvas they intend the large ones to be on, into an equal Number of little Squares, and to transfer what is in the Squares of the Design, into the correspondent Squares of the Canvas. This Way some greatly approve of.

Here follows another, which, in my Opinion, is easier and surer. Provide a Scale proportionate to the little Design, and another proportionate to the Canvas. To make a Design the first Thing to be determined is the Scale, which is to fix the Measures of all the Parts of the Work. Thus, in the little Design A, the Scale B C of five Parts, which we may call Feet, is the first Thing made. From this Scale are taken the Horizon, the Height and Distance of the Trees, the Breadths of the Walks, &c.

To enlarge this Design the Method is this: Consider whether or no the Draught is to have its natural Horizon, i.e. Whether, when the Bottom of the Painting is on the Ground, the horizontal Line be the Height of the Eye, which is about five Foot. Then, of the five Divisions between B and C, make a Scale of five Foot, F G, that thus, having taken all the Measures and Proportions in the small one, you may transfer them to the great one, after the following Manner.

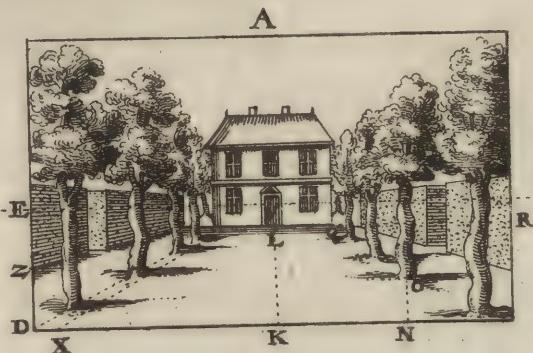
The two Scales thus fixed, the first Thing to be done is, to take in your Compasses the Distance between the Base Line D, and the Horizon E, and to apply the Compasses thus opened, to the little Scale B C, nothing what Number of Parts it includes, as here it does five. Take therefore five Divisions on the large Scale F G in your Compasses, and set them on each Side the Painting, or large Design, beginning at the Bottom of the Cloth H H, and ending in I I. From the Points I I, strike, or score a Line with a chalk'd or blacken'd Packthread. This Line I I, will mark the Horizon in the large Draught. Then take the Distance, or Depth, K L, of the little Design, which gives the Foot of the House, and set it on the little Scale: Note how many Divisions it includes, and take the same Number from the large Scale, and set them on the Edges of the Canvas, H M, H M, which you must strike with a Pack-thread, for the Depth of the second Tree. Proceed to take in the little Design, the Distance N O, and set it on the little Scale, then take as many in the large one. Again, N O includes two Parts of the little Scale; accordingly two Parts are to be taken on the great one, and set off from H to P, which must be struck as before. Do the same for all the Parallels to the Base Line, as the other Trees, Windows, Roofs, &c.

As to Perpendiculars to the Base Line the Method is the same as for Parallels; only that they are to be struck or scored not from the Side, but from the Top and Bottom. Thus, for the two Corners of the House, the Interval between them being taken in the Compasses, must be set on the little Scale, and being there found equivalent to seven Divisions and a half, as many Divisions must be taken from the great Scale, by which you will have H S T S, to be struck as before. And the like must be repeated for all the other Perpendiculars, as Buildings, Trees, Pallisades, &c.

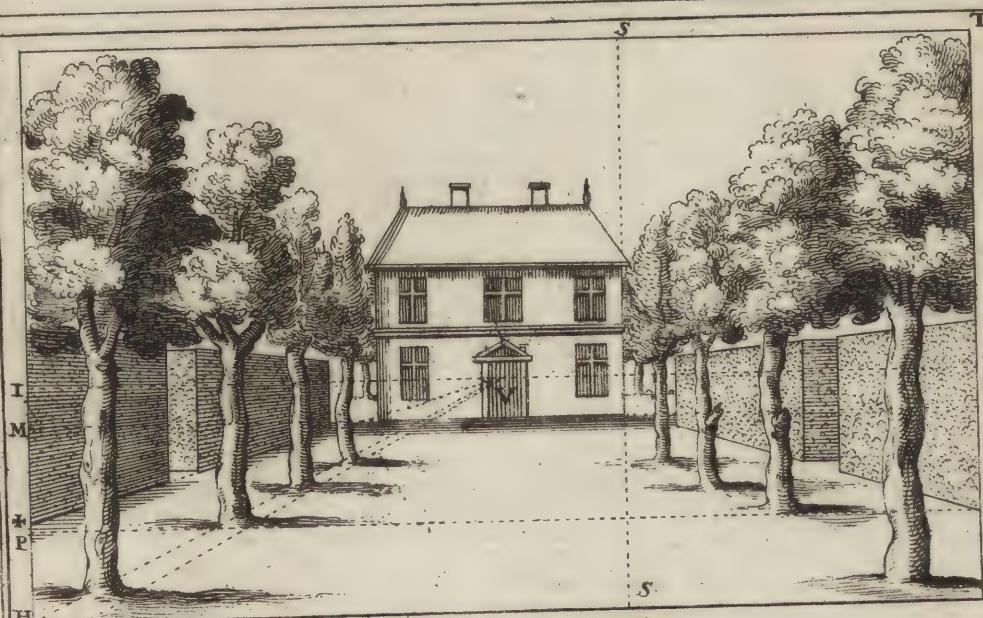
To find the visual Rays, which are the Lines proceeding to the Point of Sight V, fasten a Pack-thread to this Point V, of the Length of the Painting, and with this strike or score all the Rays very exactly. Thus, for the two Rays D X, which give the Breadth of the Trees in the little Design, take the Distance D X, set it on the little Scale B C, and take an equal Number of Divisions from off the great Scale, this will give you H Y; to which Points H and Y, Lines are to be struck with the Pack-thread, from the Point V. For the Ray of the Pallisades, take the Distance D Z, and set it on the little Scale, and take as many Divisions from the large Scale; by this Means you will have H †, which are to be struck from the Point V, as before.

Every Thing in a Perspective ordinarily comes under one or other of these three Sorts of Lines, Parallels, Perpendiculars, and visual Rays: And having shewn how to describe these with a good deal of Ease on the Canvas, there remains nothing formidable in the reducing small Designs into great.

As to the reducing *great into little*, you have only to invert the Process; that is, take the Measures first on the large Scale, and diminish them proportionably on the small one. Thus, if the Horizon of the large Design were five Divisions of the large Scale, five Divisions of the small Scale were to be taken for the Height of the Horizon of the small Design. And so of the rest.



C 1 2 3 4 5 B



G 1 2 3 4 5 F



Apparatus to the universal Method of the Sieur G. D. L.

AS many of the People, for whose Benefit I intend this Work, may not be deep enough to see clearly into this universal Method, the Author, I believe, will allow me to make it as easy as I can, that they may be the better enabled to reap the Benefit thereof. 'Tis for this Reason I have added the two following Figures, which will call to mind what has been already touched upon in the second, third, fourth and fifth *Advertisements*. The Design whereof was to facilitate this Method, and accordingly in them is shewn how to take all the Measures on the Base Line; and that as many Rays as cut the Diagonal C F, so many Squares are formed in the Depth of the Draught; which Squares may be made of any Magnitude at Pleasure.

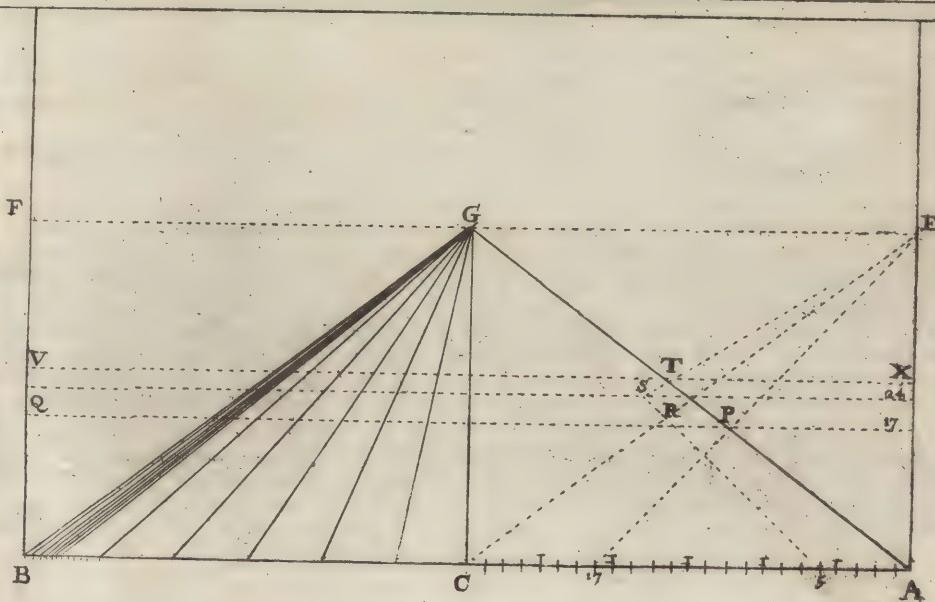
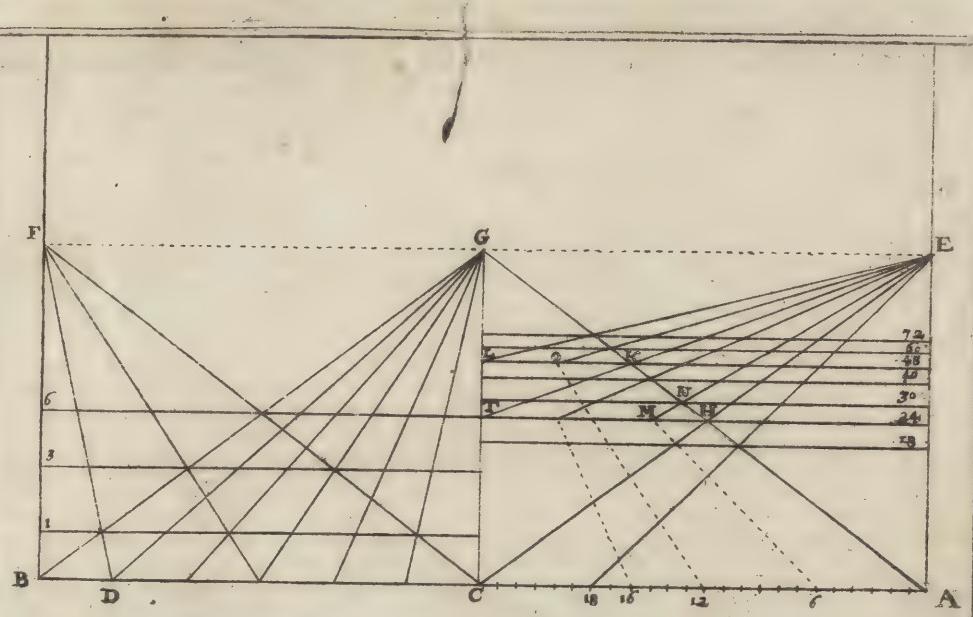
Now, not to have so far to seek, view the first Figure, where the Base Line is A B, the Point of Sight G, and the Points of Distance E F. This Base Line I divide into twelve equal Parts, which I suppose equivalent each to one Foot, and from all the Divisions draw Lines, or Rays, to the Point of Sight, whereof A and B are the last. Now, if a Line should be required that is sunk a Foot deep in the Draught, draw a Line from the first Division, B D, to the Point of Distance F; and where this Line D F cuts the Ray B G, will be the Point for a Line to be drawn through, that is sunk a Foot. If another, two Foot deep, were required; take three of these Parts on the Base Line, and from the third draw a Line to the Point of Distance F, and the Point where it intersects B G, will be the Place for that Line. Consequently, if from C a Line be drawn to F, the Point where C F cuts B G will be a Line six Foot deep.

If of the other six Parts remaining of A C, you make twenty four, by dividing each into four, and yet account each Division a Foot, you will have twenty four Feet between A and C; so that if a Line should be required eighteen Foot deep in the Draught; I would reckon eighteen little Parts from A, and from the eighteenth would draw a Line to the Point of Distance E, which by its Intersection with A G would give one Point for that Line. If a Line were required twenty four Foot deep, the whole Line A C must be taken, and from C a Line be drawn to E, and from H, the Point wherein C E cuts A G, the Line H I must be drawn, to appear twenty four Foot deep in the Draught.

In Perspective, the Line H I is equal to that of A C, i. e. contains as many Parts, or Feet. So that if from I a Line be drawn to E, the Intersection of I E with A G, will give the Line K L forty eight Foot deep. And if from the Point L, a Line be drawn to the Point of Distance F, by its Intersection with the Ray A G, you will have a Line twenty four Foot farther off than the other.

If you would have a Line thirty Foot deep, from the Point A reckon six small Divisions, and from the sixth draw a Line to the Point of Sight G, observing where it cuts the Line H I, as here in the Point M. Then from M draw a Line to the Point of Distance E, and the Line M E will intersect the Ray A G in the Point N, through which the Line required must be drawn. If a Depth of forty Foot were required, from A sixteen Divisions were to be reckoned, and the rest, to be done, as before. If sixty Foot be required, twelve Divisions must be taken, and from the twelfth a Line be drawn to the Point of Sight G, as far as the Line K L, which will give the Point O. Then, from O, a Line to be drawn to the Point of Distance, and its Intersection with the Ray A G, will give the Line.

As to the second Figure, from what has been said it is easy to find a Point of any Depth or Distance at Pleasure. It remains to shew how the same is found within or without the Rays A G or B G. In order to this, the Line B C is to serve as a Scale of six Foot, one of which we divide into twelve Inches; that we may have the half, third, fourth, &c. of a Foot. Things thus disposed, if it be required to shew a Point seventeen Foot distant, and a Foot and half within the Ray A G, a Line must be drawn from the seventeenth Division of the Base Line, to the Point of Distance E, and where the Ray A G is intersected thereby, in P, the Line P Q to be drawn. Now, since a Foot and half is required within the Ray A G, I take the Extent on the same Line N Q in my Compasies, and set it off from P to R, which Point R is the Point required. If a Point twenty nine Foot distant, and seven and a half within the Ray A G be required, a Line must be drawn from C to the Point of Sight E, and through the Point where it cuts A G, a Line being drawn, gives twenty four Foot. Then, from A taking five lesser Parts, a Line must be drawn from their Extent to the Point of Sight G, till it cut that Line in the Point S; and from S a Line is to be drawn to the Point of Distance E, and from the Point wherein it cuts the Ray A G, a Line, T V, must be drawn. And since seven Foot and an half are required beyond the Ray A, that Space must be set on the same Line from T, towards V to the Point X, which Point X will be the Point desired. After such Manner, may any Distance at pleasure be determined.



An universal Method of performing Perspective without having the Point of Distance out of the Painting, or Ground of the Work; made publick by the Sieur G. D. L.

IN this Method a geometrical Plan is required, or at least a Scale of Measures both for the Plan, and the Elevation, in order for the one or the other to be put in Perspective.

For an Object or Subject, we shall take the Author's own Example, which is a square Cage, terminating a Top in a Point, or a Building with a Pavilion Roof. The Measures whereof shall be given by a Scale.

Now having made the Plan of the Cage, *milk*, which is here added at the Top of the Figure, a Line, *ab*, must be drawn at the Distance the Object is to appear at in the Draught, as here the Line, *ab*, 17 Foot, which is to be the Base Line, or Bottom of the Piece, and to be placed according to the Aspect the Object is to be viewed in. Then, from the 2 Extremes of the Line *ab*, 2 indefinite Lines must be drawn parallel to each other, as the Line *ag*, and *bg*. On 1 of which Lines, as *ag*, you are to draw little Parallels to the Base Line, proceeding as far as the Angles of the Plan, and by Means of the Scale see how far each Angle of the Plan is removed from this Line *ag*, and mark the same on each Line. Then, from the Place the Painting is intended to be viewed from, which is here the Point *c*, 5 Foot distant from *b*, describe a Perpendicular to *ab*, *viz.* the Line *ct*; and to this Line allow as many little Parts of the Scale, as the Spectator is to be distant to view the Painting, *viz.* 24 Foot. At the Extreme of which 24 Foot, which is the Point *t*, erect a little Perpendicular, of the Height of the Eye, *viz.* the Line *ts*, equal to 4 Foot and an half.

The Cloth, Wall or Paper thus dispos'd for putting the Plan in Perspective, and making the Elevation on the Plan, divide the Base Line, *A B*, into as many Parts as *ab* in the Plan is divided into, *viz.* twelve, each accounted a Foot; and over the Points *A* and *B*, set the Height of the Line *st*, *viz.* four Foot and a half; that is, taking in your Compasses four and a half of the Divisions of *AB*, set them perpendicularly over the Points *A B*, by which Means you will have the Points *E* and *F*. Draw the Line *EF*, therefore, parallel to *AB*, and it will be the Horizon. Then, as in the Plan, the Point *C*, which is the Place the Draught is to be viewed from, is five Divisions distant from *b*, you are to reckon as many Parts from *B*; and from the fifth, *C*, erect a Perpendicular to *AB*, which cutting the Horizon in the Point *C*, gives the Point of Sight to which all the Rays *AG*, and *BG*, representing the Parallels of the Plan *ag*, and *bg*, must be drawn.

As to the Point of Distance, it will be the Point *F*, and as the Line *ct* is 24 Foot long, 6 Divisions must be taken from the Line *AB*, *viz.* from *A* to *D*, and each subdivided into 4; which 24 Parts are to serve as a Scale for the Depths or Distances, being sufficient for the same, tho' they were infinite. And the 6 Parts remaining between *B* and *D*, will be a Scale for the Feet, according as the Lines drawn from the Points found for the Plan, shall cut the Rays drawn to the Point of Sight *G*. For as this Scale is a Pyramid, whereof *BD* is the Base; the Measures diminish in Proportion as they are farther off. One of the Parts is divided into Inches, that all the Measures may be there, as on the Plan.

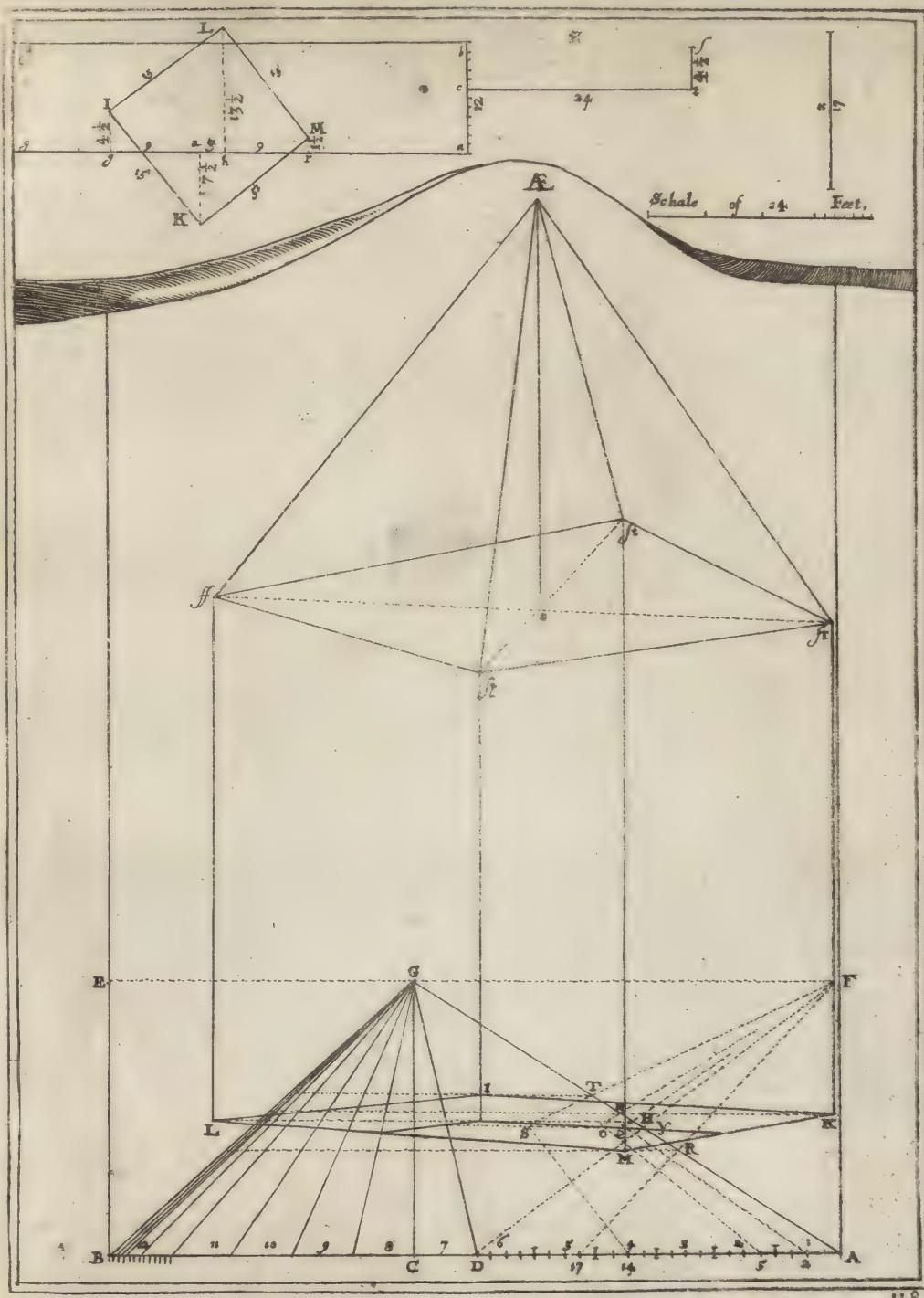
By the Scale of Distances, the Points of the Plan are found, and by the Scale of Measures the Lengths of the Lines both of the Plan and Elevation.

Now to put the Plan in Perspective, all the Measures of the geometrical Plan must be observed. The first Angle of the Plan *rm* is 17 Foot distant from the Point *a*, on the Line *ag*. For this Reason we reckon 17 Parts, beginning at *A*, and from the seventeenth draw a Line to the Point *F*, cutting the Ray *AG* in *R*. From this Point, *R*, a Parallel to the Base must be drawn: And by Reason the Plan *m* is within the Ray *ag*, by a Foot and an half, therefore, on the Side *B D* of the Line *R*, must a Division and an half be taken, and set off within the Ray *AG*, which will give the Point *M*, representing the Angle of the Plan *m*. As to the Angle *l*, which is 26 Foot distant from the Point *a*, a Line must be drawn from the Point *D*, which is 26 Foot from *A*, to the Point *F*; and where the Ray *AG* is intersected thereby, *viz.* in the Point *y*, a Parallel is to be drawn. Now as the Point *y* is not remote enough by 2 Foot, a Line must be drawn from the second Division of the Scale to the Point *G*, and where this Ray cuts the Parallel *y*, *viz.* in the Point *Q*, the Line *QF* to be drawn, which will give the Point *H* on the Line *AG*: From which Point *H* a Parallel to *AB* must be drawn, and on the Side *B D* of the same Line *H*, mult the Divisions for 14 Foot and an half be taken, *viz.* from the Point *H* to *L*.

For the Point *k*, which is 29 Foot distant from *A*, a Line must be drawn from the fifth Part of the Scale *AD*, to the Point *G*, and where this Ray intersects the Parallel *y*, *viz.* in the Point *O*, the Line *OF* must be drawn, which gives the Point *N* on the Line *AG*. Then from *N* draw a Parallel, the Side whereof, *BD*, 7 Foot and a half must be taken, to be set off without the Ray *AG*, *viz.* from *N* to *K*.

For the Point *i*, which is 38 Foot from *a*, take 14 Divisions on the Scale *AD*, and from the fourteenth draw a Ray to the Point *G*, which cutting the Parallel in the Point *S*; from that Point draw a Line to *F*, cutting the Ray *AG* in *T*, which is 38 Foot from the Point *A*, inasmuch as the Parallel *y* is 24; to which, 14 being added, gives the whole 38. And since the Angle *i* is 4 Foot and an half within the Ray *AG*, that Extent must be set on the Side *D B* of the Parallel *T*, *viz.* from *T* to *I*.

To form the Plan, those four Points *M L K I* must be connected by right Lines, and Perpendiculars erected from their Angles, as *Mβ*, *Lff*, *Kfr*, and *Iβ*; each of which will be seventeen Foot, as is express'd in the Plan by the Line *X*. Then, from the Extremes of these Perpendiculars, draw two Diagonals *β*, *fp*, and *ff*, *fr*, which intersecting in *Z*, from the same Point *Z* erect a Perpendicular, *ZÆ*, thirteen Foot and a half. Lastly, drawing Lines from all the four Angles *β*, *ff*, *fp*, and *fr*, to the Point *Æ*, the Cage will be formed in Perspective. If you would have it sunk a Foot under Ground, add a Foot underneath each Point of the Plan, and connect them by Lines.



H h



To give any precise Distance required, without removing the Point of Sight out of the Piece.

SUCH as are disposed to make use of this universal Manner ought to know, that the Number of Feet you take on the Base Line are to have a regard to the Point of Distance proposed.

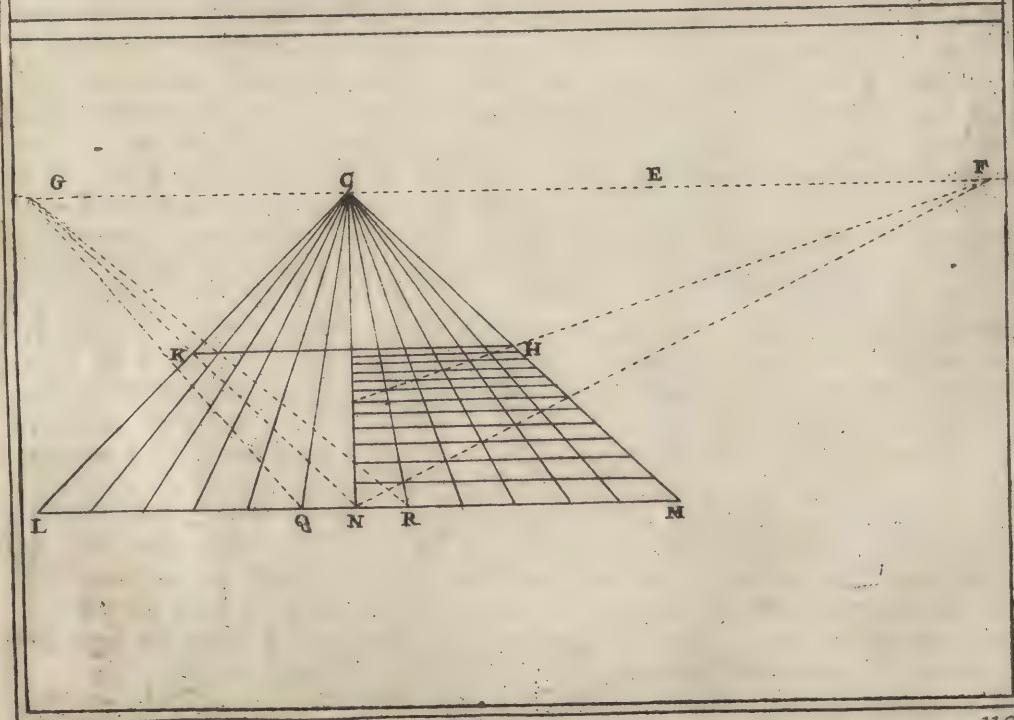
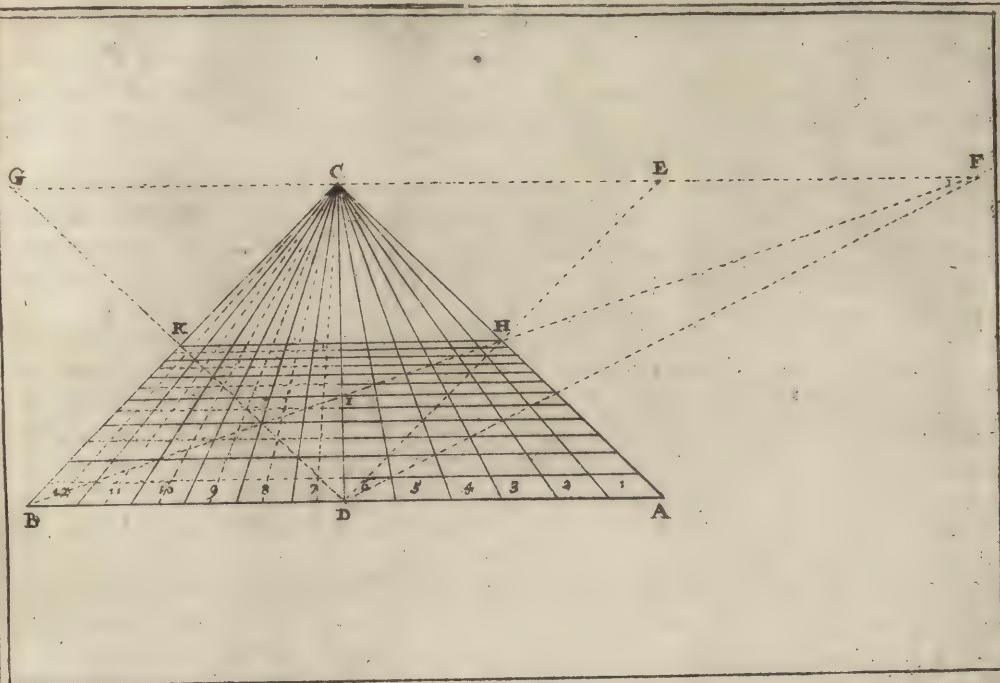
To make the Proposition understood: In the first Figure are put two Points of Distance, the one six, the other twelve Feet, which have an easy Ratio to each other; inasmuch as the six Parts being each divided into two, you have twelve.

Suppose then the Line A B divided into twelve Parts, and from each Division Lines drawn to the Point of Sight C; take half these Divisions, A D, and from D to the Point E, which is the Distance of six Feet, draw D E. 'Tis certain its Intersection with the Ray A C will give the Diminution of the Squares viewed at six Foot Distance. And if from D a Line be drawn to F, which is the Distance of twelve Feet, the Line D F cutting the Ray A C will give the Diminution of six Squares, view'd at a Distance of twelve Foot. And if the Diminution of twelve Squares, viewed at twelve Foot Distance, were required, from the Point B, which is the whole Base Line, a Line must be drawn to F, and its Intersection with the Ray A C, in the Point H, will give the Thing required. Or from I a Line I F is to be drawn, which will give the same Point H, the Line H K, in each Case, being the Depth of twelve Squares, viewed at twelve Foot Distance. Hence we observe, that twelve Squares, viewed at twelve Foot Distance, meet in the same Line H K with six Squares viewed six Foot off, and that all the Lines of the six Squares, given by the Intersection of the Diagonal D G, have a Relation two by two to those given by the Diagonal D F. The Reason why the Diagonal D F gives two Lines for one of those D G, is, that the Distance is double. If it were triple, it would give three, and four if quadruple. Now, to find the same Intersections, and the same Number of Squares on the Side B D, as are on that A D, without having the Point of Distance out of the Piece, you have only to divide each of the six equal Parts between B and D into two, by which Means you will have twelve Parts: Then draw occult Lines from each Division to the Point of Sight C, and drawing Parallels to the Base Line thro' all the Intersections the Diagonals make with all those Rays, you will have twelve Squares Depth in the same Line as if the Distance were twelve Foot, tho' in Reality G be but six. The Reason is, that in multiplying the Rays you multiply the Squares, and multiplying the Squares you remove the Distance farther. Such is the Reason why having made twelve Parts of the six that were between B D, there are procured twelve Squares, which have the same Depth as if at twelve Feet Distance. And if a Distance of twenty four Feet were required, you have only to divide each of the Parts between B and D into two, which making twenty four Parts, from the twenty fourth draw a Line to the Point D, and the Point K, wherein it intersects the Ray B C, will be the Depth of twenty four Feet.

In the second Figure the same Measures are laid down on the Line L M, as on A B of the first Figure, and the same Depth and Distance on the Side M N, as on the Side A D, which gives the Line H K; to shew, that if a Line were drawn from the fifth Part, as Q G, or from the seventh, as R G, the true Depth would not be had, which is at K. For R G would not sink it enough, and Q G would sink too much; even tho' of those five or seven Parts there were made twelve or twenty four.

For this Reason you are always to observe to take a Number which may be multiplied by the Distance, as here the Distance of 6 may serve for 12, 18, 24, 30, 36, 42, 48, &c. the Distance 5 may serve for 10, 15, 20, 25, 30, &c. and the Distance 8 for 16, 24, 32, 40, 48, &c. In this Way you cannot fail; for supposing the Point of Distance cannot be nearer the Point of Sight than G is to C, it follows, that if G be six, seven, eight, or ten Foot from C, that then half the Base Line will have the same Number, which is to be divided proportionally to the Distance intended. For Instance, if there be eight Foot from N to L, and I require a Distance of thirty two Feet, without moving G out of its Place; I divide each of the eight Parts, or Halves of the Base Lines, as L N, into four, accordingly, four Times eight make thirty two Rays. So that the Diminutions of the Squares will be thirty two Foot distant.

These little Divisions do none of them remain after the Painting is finished, only the principal Divisions of Feet, which are drawn to the Point of Sight, and the Diminutions, that is, the Parallels to the Base Line, which still stand.



A very curious Method of drawing all Perspectives in the most natural Manner, without observing the Rules.

HAVING given you all the Rules to be observed in drawing of Perspectives in the exactest Manner, I have thought fit to add this and the following Method of drawing the same very elegantly and exactly, without being tied to the Observation of any one Rule.

It may be of good Service to such as love Painting, and take Pleasure in practising the same, without being willing to be at the Pains of opening the Compasses, or taking up the Ruler, to draw Lines. For in this Method neither the one nor the other are required; and yet the finest Draughts may be made hereby, of Buildings, Gardens, Landskips, &c.

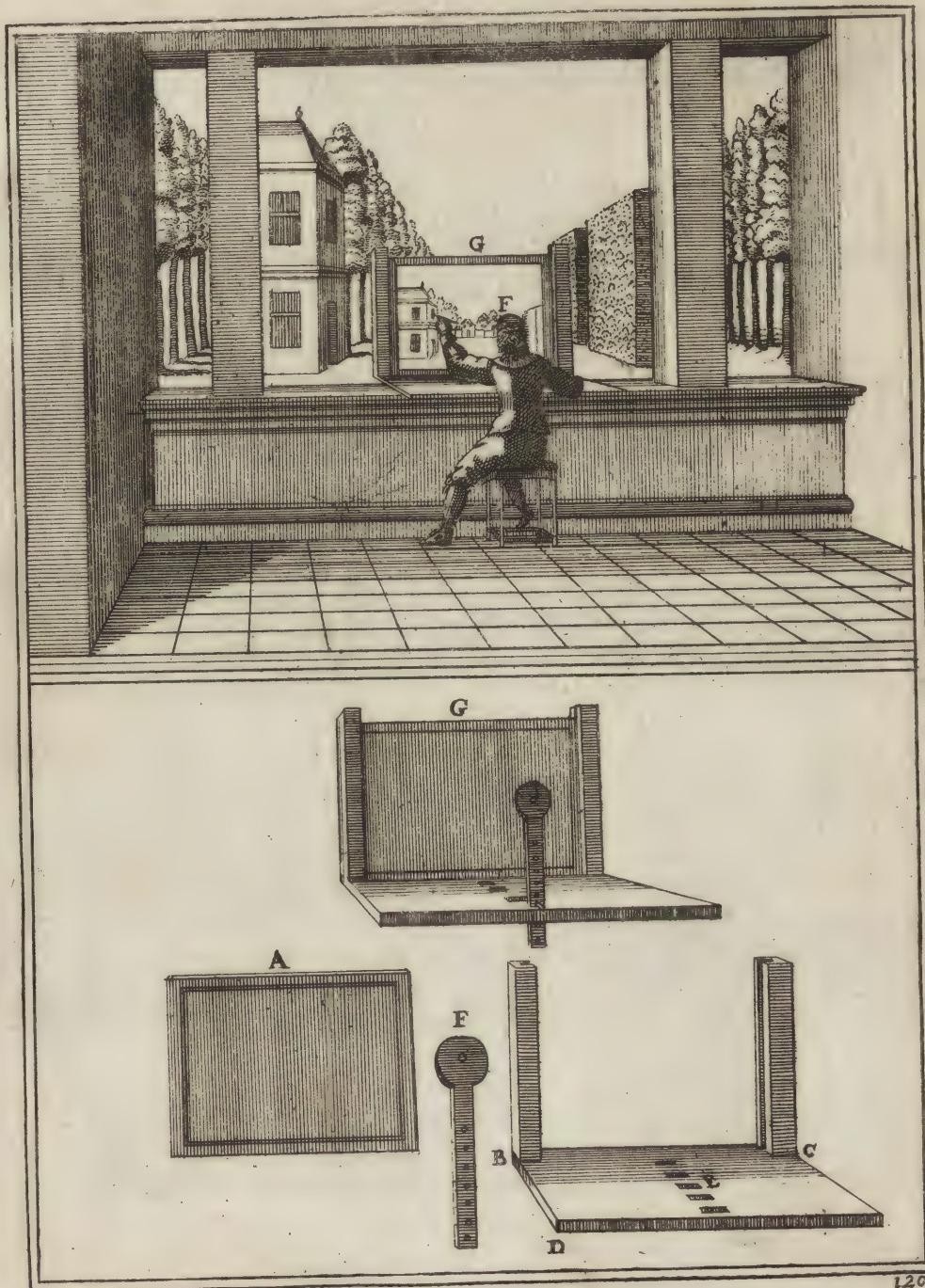
Before we come to the Method itself, it must be observed, that the principal Requisite therein, is a large Piece of fine clear Glass, fitted in a fine wooden Frame, expressed at the Bottom of the Plate by the Letter A. This Frame is to slide between two Cheeks, or Pieces of Wood an Inch and a half thick, which are raised at the two Extremes of a Board the Breadth of the Frame, i. e. about a Foot broad, as shewn in BC, which is disposed to receive the Frame A. In the Middle of the Board one or more square Holes must be made, as in E, to receive the slit Ruler F, so as it may be raised or lowered at Pleasure. At the Top of which Ruler is a Circle of three or four Inches Diameter, but no Thickness, being made of Tin, or the like, and having a little Aperture, about the Size of a Pea, in the Middle. The whole is represented together in G.

Now, tho' the mere Figure shew the Application, yet we shall describe the Method of Proceeding. Having, therefore, placed the Instrument G before the Object you would draw, look thro' the little Hole, or Sight, F, and if you see all the proposed Objects represented on the Glass, the Instrument is fixed, otherwise, bring the Sight nearer the Glass, till you see the whole of what is required. The Piece thus rectified, you are to draw on the Glass every Thing that you see thereon thro' the Hole F; which has the same Effect here, as the Point of Sight in the other Methods. And it is certain, every Thing thus drawn on the Glass, the Eye being fixed to the little Hole, will be according to the strict Rules of Perspective.

Every Body knows how to take, or copy off what is thus design'd on the Glass. 'Tis best to draw the Lines and Figures on the Glass with Pen and Ink, then wetting the Backside of the Glass a little, and laying a moist Sheet of Paper on the Side that has the Design, rub or press the Paper gently thereon with the Hand, and the whole Draught will be impressed or transferred from the Glass upon the Paper.

Some advise to make use of a Pencil and Colours, and in Effect, every Body is left to their own Discretion. 'Tis enough to know the Method in general. A Design of a Palace is as easily taken this Way as a Landskip, and a Church as a House or Chamber: All required in any of them being to pitch on a Place where the whole Thing to be represented may be seen, and to bring the Sight to the proper Nearness to the Glass.

A Painter may use the same Method for the drawing of Figures, Postures, &c. from Nature, Statues, Relievo's, and, in fine, every Thing: It being certain, that a little Practice will render the Method exceeding feasible and easy.



Another elegant Manner of practising Perspective,
without understanding it.

THIS Method is as curious as the former, and some even prefer it, by Reason there is a double Draught required in that, one on the Glass, and a second copied or imprinted from it. Whereas in the present Method only a single Draught is made, and that as exactly as the former.

I shall not describe the Structure of this Instrument, it being the same with that already mentioned; excepting that the Frame, instead of a Glass fitted in it, must be divided into a Number of little Squares by fine Threads drawn at equal Distances from each Side of the Frame, across each other, forming what we call a *Reticula*, or Lettice. As to the Number of Squares, it is left to Discretion: All we need add is, that they must not be too large that you may work the more exactly, nor too small for Fear of being confused.

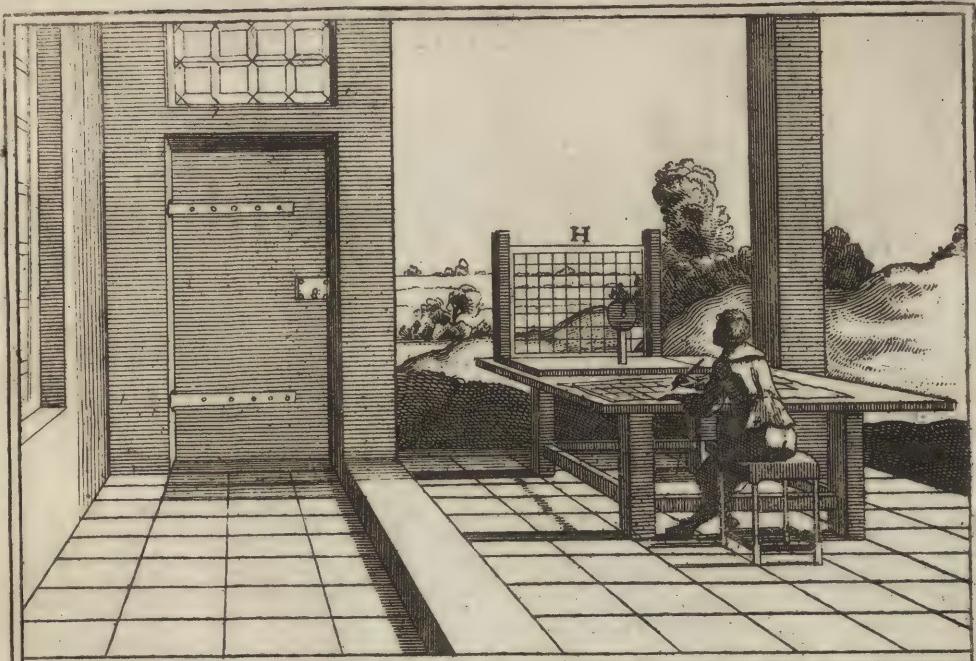
For the Practice, place the Piece H in such Manner as that you may see all the Objects you mean to design, thro' the Hole of the Sight I. If the Design should be larger than the Compass of the Frame, or *Reticula*, or Chequer, Squares must be made on the Cloth, or Paper, larger than those of the Frame. If the Design be intended smaller on the Cloth, &c. than the Frame is, make the Squares less; otherwise they are to be of the same Size. But in all the Cases make the same Number of Squares on the Paper, &c. as you see in the Frame when you look through the Sight I. Thus, transferring proportionally from the Squares in the one, to the corresponding ones in the other, the Perspective will be as just as if you had gone by the strict Rules, and used the Compass, Ruler, &c.

The two Figures shew how the Piece H is to be placed, in order to design on a Table. The Expedient is of excellent Use in Painting, and serves to draw very exactly, any Perspective Draught, to copy Paintings, draw to the Life, &c.

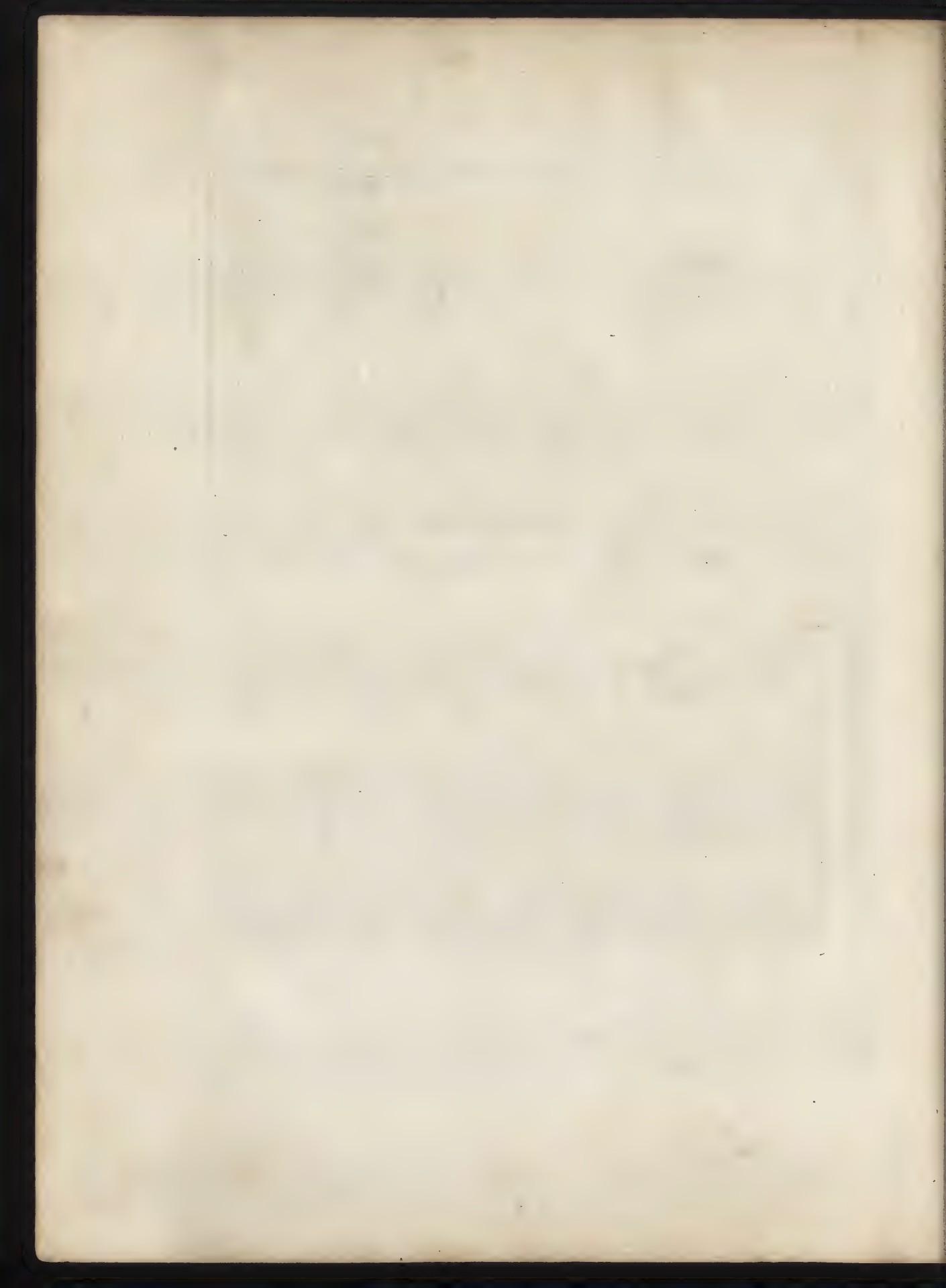
Some People will be apt to urge, that the Method is not new; there being few Painters but what know how to enlarge or diminish Paintings by Means of the Chequer, or Squares. All this we must allow, but must take the Liberty to say, that we don't know of any that ever yet used the Sight; which, however, is the great Means of doing any Thing in Perfection.

PRACTICAL.

121



121





M E A S U R E S

A N D

P R O P O R T I O N S

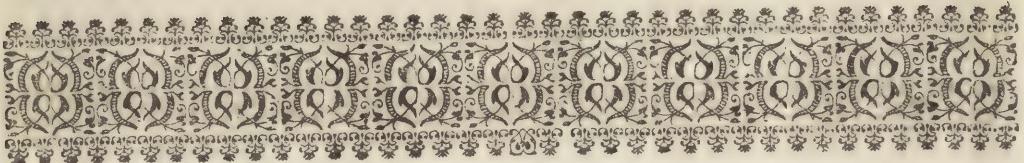
O F

F I G U R E S

F O R

Perspective DRAUGHTS, PAINTINGS, and
RELIEVO'S.





Figures in Perspectives.

HAVING now shewn to draw all Kinds of Perspectives, with their Ornaments, and other Circumstances necessary to please the Eye, there remains nothing to deceive it entirely, but to add Figures.

But before we go farther, we must distinguish between Figures, it being one Thing to represent a History, and another to aim to deceive the Eye by a Piece occasionally placed in a Gallery, Hall, Garden, or the like. In these latter, still Figures do best, whereas in a History-Piece they must all be, as it were, animated by the Diversity of their Postures, &c.

The Number of Horizons which our Painters frequently introduce in the same Piece, leads them in to an Infinity of Faults, in not being able to give the Figures their proper Heights, proportionate to their Horizons. I shall therefore here give a single Rule, which may prevent their failing, be the Horizon what it will.

For Figures that have the Eye in the Horizon.

IN Perspective Draughts placed at the End of a Gallery, Hall, Walk, or the like Place, to deceive the Eye, the Horizon should always be its natural Height, that is, five Foot, which is that of an ordinary Size.

And Figures intended to appear there as natural must have the Eye in the Horizon: For, having the Eyes in the same Horizon with ourselves, they will be of our own Height. This might be let pass as sufficient Instruction, but to make the Point yet clear and more obvious, I shall instance in these three Figures, instead of twenty others which might be brought.

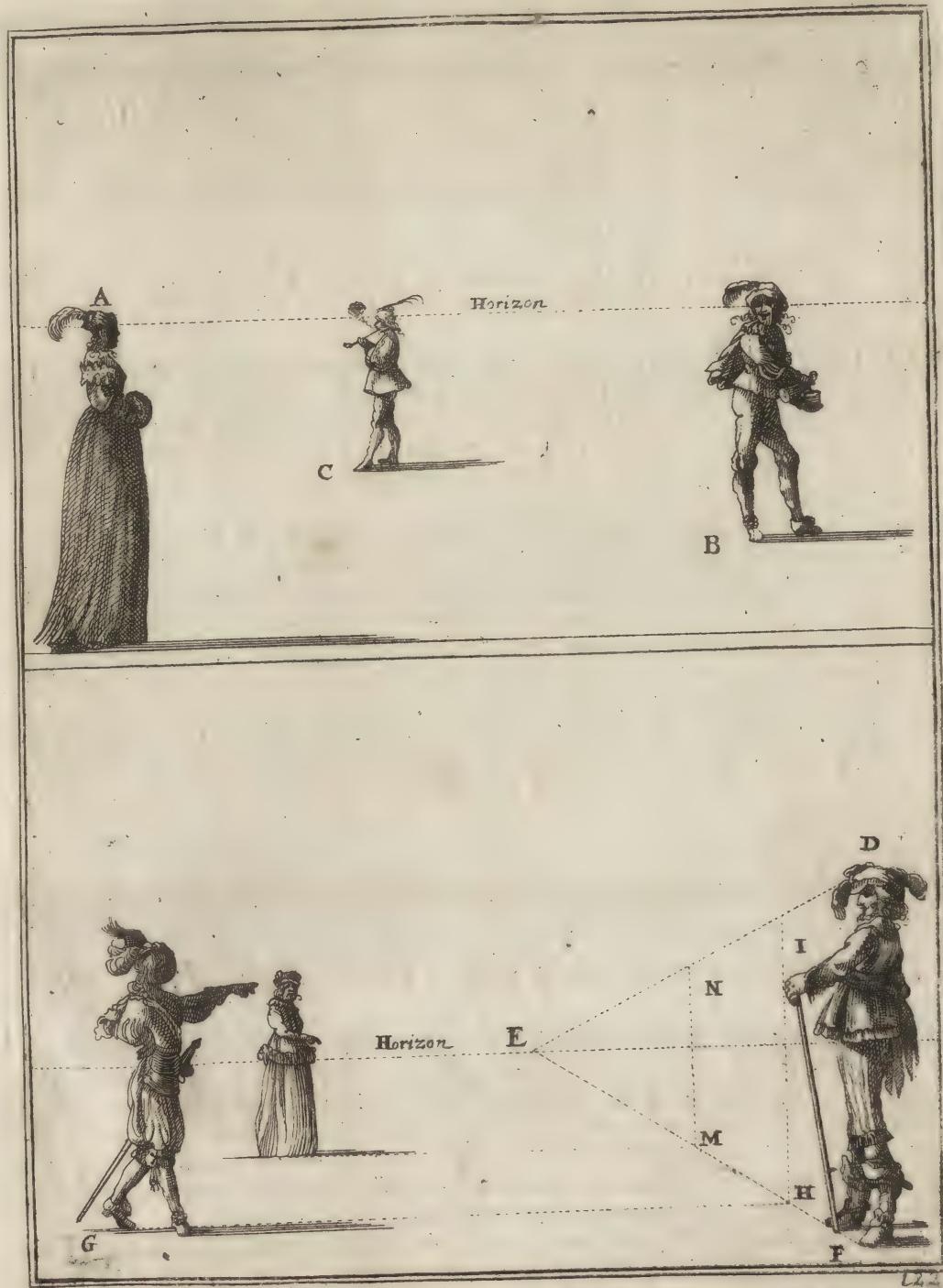
The first Figure A is thenatural Height, and has its Eyes in the Horizon. If a second Figure be required in the Place B, from the Point B a Perpendicular must be raised to the Horizon, and it will appear of the same Height with the former. If you require a third at C, let his Eyes likewise be in the Horizon, and he will be the same Height with the rest, in Appearance. In Effect, tho' there were a Thousand, there need no other Rule be regarded, when the Horizon is the natural Height. I must not here be understood as including Children, which are to be made in Proportion to the large Figures, according to the Discretion of the Painter.

For Figures that have a low Horizon.

IN Paintings for Halls, which are usually hung pretty high, the Horizon must be lower, to bring it as near the Eye as possible.

Now, to give each Figure its just Height and Proportion in whatever Part of the Painting it be, some one must be drawn of any Height at Pleasure, in any Part of the Piece, as the Figure D F, which is here to do the Office of a Line of Elevation.

And to find the Height of the other Figures in the Painting which are to appear as high as the first, draw Lines from the Head and Feet of this Figure D F, to a Point in the intended Horizon, as E, and within this Triangle D E F, will be found the Heights of all the rest. Thus, e. gr. if the Height of a Figure in the Point G be required, from that Point G I draw a Parallel to the Base G H, till it intersect the Line, or Ray D E in the Point I, and the Perpendicular H I gives the Height of the Figure, which is to be taken in the Compasses, and set off in the Point G. If another be required in the Point K, the same Operation is to be repeated, and we shall have the Perpendicular M N for the just Height. And so of the rest.





For Figures that have a high Horizon.

WHEN the *Horizon* is *high*, as we are sometimes obliged to make it, in order to represent an Object viewed from some Eminence, the same Rule already laid down for a low Horizon must be observed, all the Figures in the former Case being above the first, and all less and less; and in the present Case all of them likewise raised above the first, and the remotest always the highest, and at the same Time the smallest in Proportion.

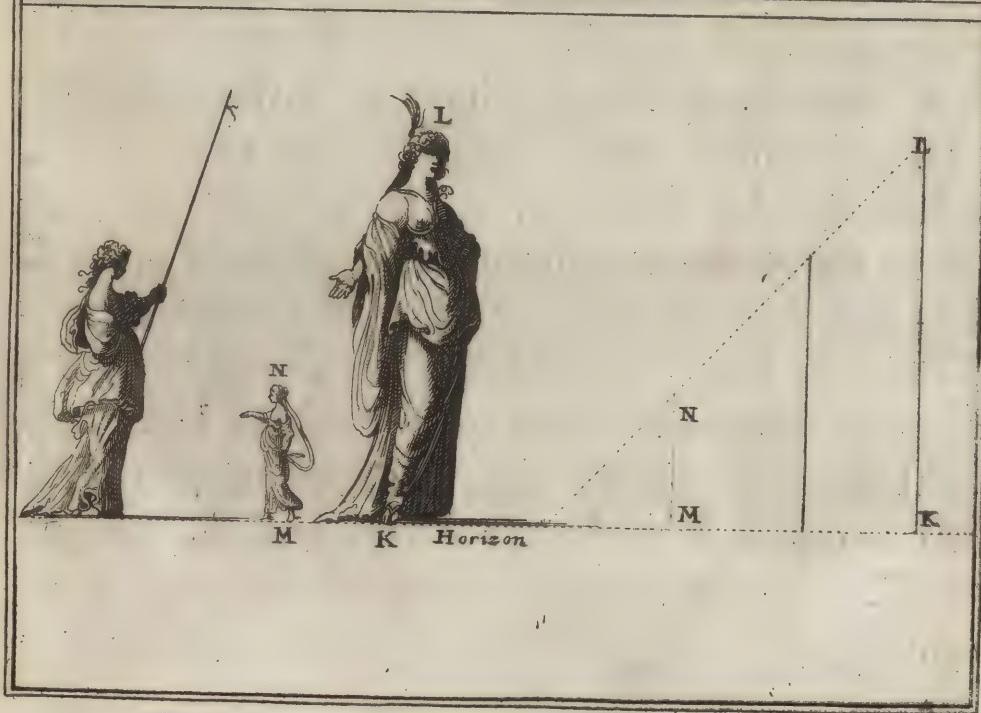
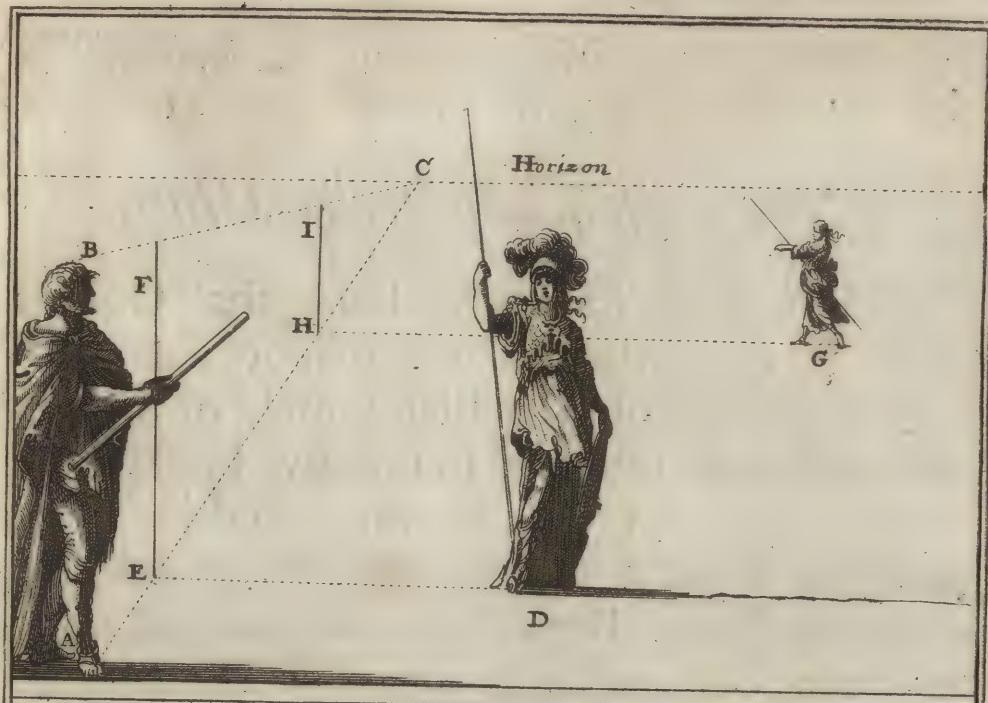
Having drawn the first Figure, A B, draw a Line from the Top of its Head, and the Bottom of its Feet, to some Point in the Horizon, as the Point C, then will all the Heights of the other Figures be taken within this Triangle A C B. For Example, if you would have the Height of the Figure in the Point D, from D draw a Parallel to the Base Line D E, as far as the Line A C, which will give the Point E, from which a Perpendicular is to be raised as far as the Line B C, which will give the Point F. This Perpendicular, E F, will be the Height of a Figure in the Point F. If a Figure be required in the Point G, the same is to be done as for D, and you will have the Perpendicular H I, for the Height of the Figure G. By the same Method the Heights of all other Figures in any other Places may be taken.



For Figures that have their Feet in the Horizon.

IT is but rare that Figures are made above the Horizon, but where there is a Necessity for it, those intended to appear the foremost must be made the largest, that is, they must be made the natural Height, and all the rest being made less, as they are more remote, will appear equal to them. Thus the Figure K L is here the biggest and the nearest, and M N the remotest. All the Secret here, is in the Painters finishing the front Figures more than those behind, and still the farther off they are, the feinter and less perfect must they be.

The Rule for these Figures, and for those which have their Eyes in the Horizon, is no other than their own Height. For in each Way, all you have to regard, is to make them less, and feinter as they are thrown farther behind.

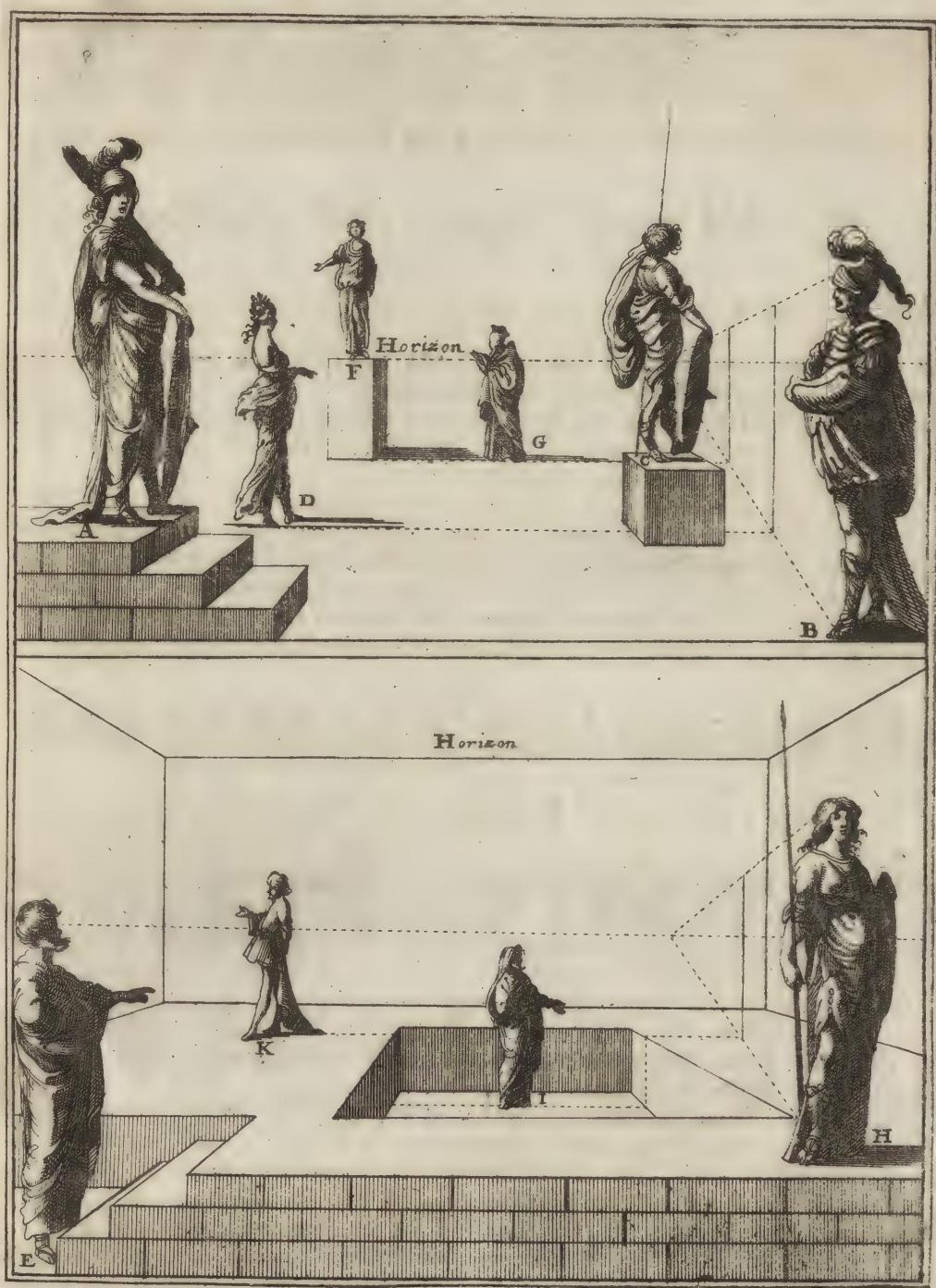


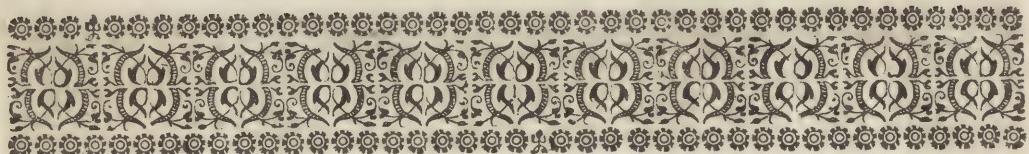


Figures raised above the Plan.

TH E R E are some who hold, that Objects raised above the Ground are more diminish'd than if they were on the Plan ; and, of Consequence, a Figure mounted four or five Foot should be smaller than if on the Earth. And the Rule is good for Figures a great Height, as shall be shewn in its Place : But a Rise, like that just mentioned, can only make an insensible Diminution. For supposing such an Object, or Figure, may be seen at one single View, that is, without raising the Eye, it must be the same Height when rais'd, as when on the Ground. Thus, the Figure A must be the same Height as B, and the Figure C as D, and F equal to G, and so of the rest.

The same Reason holds for Figures below the Plan, which are to be represented of the same Height as those above it, as is shewn in Figure E, which is equal in Height with H and I, and as big as K. These two Examples may serve for all Cases.





The Postures of Figures in Perspective.

TH E R E must be a deal of *Choice in the Postures*, or Attitudes of the Figures, to deceive the Eye. For 'tis not all of them are good, as we have already observed. This Consideration has determined me to add a few, which may pave the Way for the Invention of numerous others.

The first is a Man who reads, standing; the second is reading an Advertisement posted on the Wall; the third plays on a Lute; the fourth is asleep; the fifth is lolling, with his Back turned on the rest, who are ranged two by two; those marked 6, are looking on a Draught on Paper; the remoter, mark'd 7, are in earnest Discourse. One might add others, playing, speaking, or discoursing at Table, writing, praying, &c. In Effect, you have a Choice of an Infinity of Postures, provided they be such as that a Man may continue 'em for a Time. But never use such as are much in Action; for you can never be deceived in seeing a Leg or an Arm in the Air, or a Person running without shifting his Place.

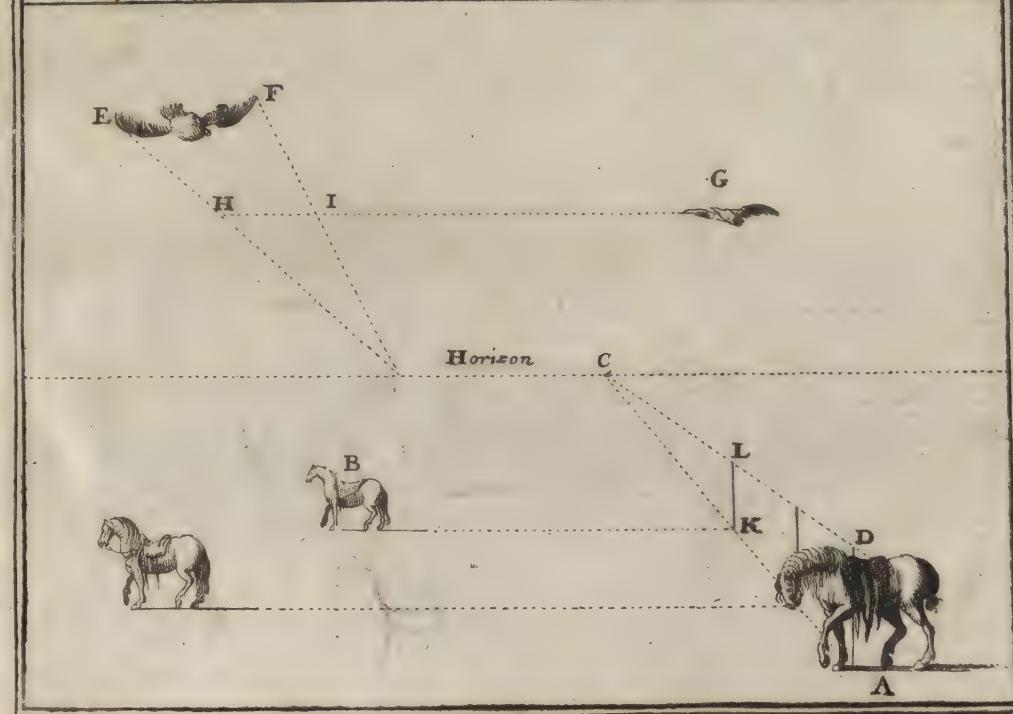


BEASTS and BIRDS in Perspective.

TH E same Rules must here be observed as in human Figures, giving each the Height or Breadth of the first, and from the two Ends of this first Measure drawing Lines to the Horizon for the Measures of all the rest. For Example, having intended the first Horse, A D, to be the Height of that other, B, from the Line AD draw a Line to the Horizon C, and from B draw a Parallel to the Base Line BK, till such Time as it cut the Line AC, which will give the Point K; from which a Perpendicular, KL, being erected, will give the Height of the Horse in the Point B.

As to Birds: From the Extremities of their Wings, FF, you are to draw Lines to the Horizon, and between those Lines to take the Dimensions of the rest, which we suppose of the same Size. For Example, to have the Magnitude of a Bird in the Point G, draw a Parallel to the Base Line, GH, till such Time as it cut the Rays E and F, which will give the Line HI for the Magnitude of the Bird G.

When Beasts or Birds are required, you must always make Choice of such as are the stillest, or least active, as a Dog sleeping, or gnawing a Bone, a Cat watching a Mouse, a Parrot, &c.



K k



To find the Height of remote Figures, whereof the first is on a Mountain near the Eye.

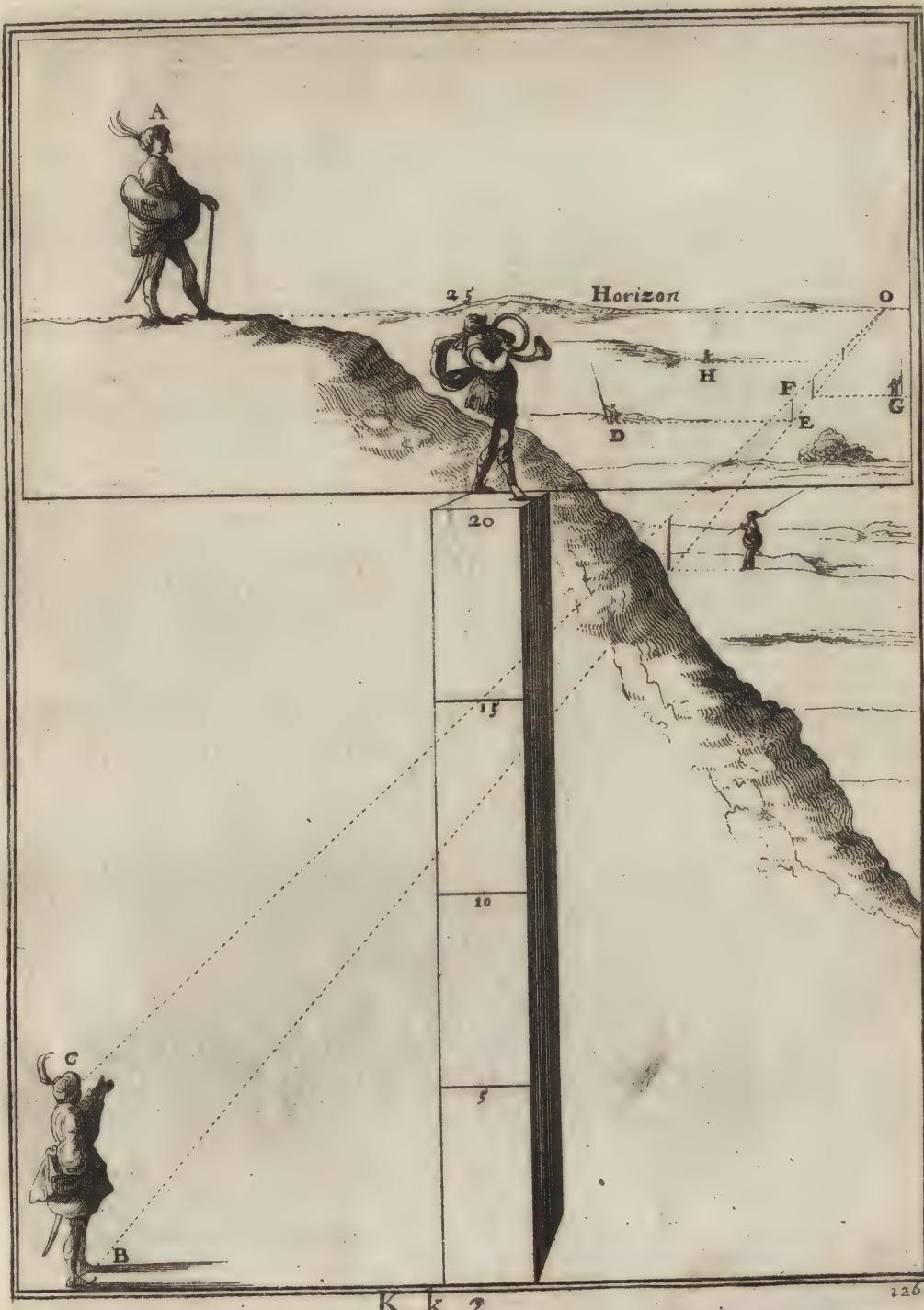
IT is a Thing that gives a deal of Satisfaction to the Mind, when a Person knows what he does: On which account the Reader will be well enough pleased to have the following Rule, which few Practitioners are acquainted withal.

When such Figures are to be made determine the Height of the first, that is, the Space of the Ground you would have it rais'd; and at that distance put another Figure underneath, of the same Height as the first; and from the Feet and Head thereof draw Lines to the Horizon; by which you will have the Height of the other Figures in the Champain. To explain myself:

The Figure A, for Example, which is a-top of a Mountain, is five Foot high, which is the natural Height; and I suppose the Mountain twenty-five Foot high: If now a Man be rais'd twenty Foot, as is the Piece in the Middle, whereon the Spectator is mounted (who himself is suppos'd five Foot high) the Horizon will be twenty-five Foot as well as the Mountain; and consequently will rase the Top of the Mountain: As is expressed in the Figure.

Now to find the Height of the little People in the Champain make a Figure twenty-five Foot lower, underneath the Figure A, or in some other Place, as B C; and from the Feet B, and the Head C, draw Lines to some Place in the Horizon, as the Point O; and between those two Lines, B and C, drawn to O, take the Height of the little Figures, as already taught. Thus, for the Height of the Figure D, draw a Parallel to the Base-Line, till it cut the Line B in the Point E; from which a Perpendicular is to be rais'd, cutting the Line C O in the Point F: And take the Height of this Perpendicular E F, for the Height of the Figure in the Point D. If you likewise require the Height of the Figures in the Point G and H, proceed after the same manner as in the Figure D, and you will have their Heights between the Lines B and C; to be taken in the Compasses, and set off in the Points G and H. The same you are to do for any other Figures, still diminishing, till at length you come to a mere Point.

This is all we have to say as to the Measures of Figures in Perspective: But as I have ingag'd myself to give all the Measures of this Kind, the following Rules come in my way, though they have no strict Relation to that Art.





To give the natural or any other Height to Figures much elevated.

TO omit nothing relating to the Heights of Figures we add the two following Rules : The first given by *Albert Durer, Serlio*, and others, for writing of Letters on eminent Places ; so as they may appear of the same Size as those at Bottom. But for the same reason it may be applied to find the Measures and Magnitude of Figures which shall appear equal when view'd from a certain Place wherein the Spectator is.

Thus in B there is a Man five Foot high, and fifty distant from the Tower A, viewing the first Figure C, which there appears of the natural Size ; and thirty Foot higher another Figure is to be placed, which shall appear of the same Size as the other, when view'd from the same Place. Now, to find its Dimensions describe a Quadrant of a Circle, or a lesser Arch, on a Paper to be placed before the Eye ; then looking at the Feet, and the rest of the Figure C, it will give the Distance or Angle, E F, on the Paper. This done without moving the Quadrant look at the Point D, where the Foot of the Figure D I is to be ; and observe what Point it gives in the Quadrant, *viz.* G. And from this Point G set off the same Distance or Angle, as that of the Figure C, *viz.* E F, which being remov'd to G gives G H. Then looking through the Point H, note what Part of the Perpendicular rais'd from D is cut thereby, *viz.* the Point I, then will the Interval D I, be the Height requir'd for the Figure to be placed there. If you would have another still higher the same Operation must be repeated, and they will all appear of the natural Bigness to the Spectator, B.

If you require the Reason thereof you must recollect the Principles already laid down, or recur to them again ; and you will find that all Objects view'd under equal Angles appear equal. Now 'tis certain, that the Angle G H is equal to EF ; consequently the Figure D I must appear equal to the Figure C.

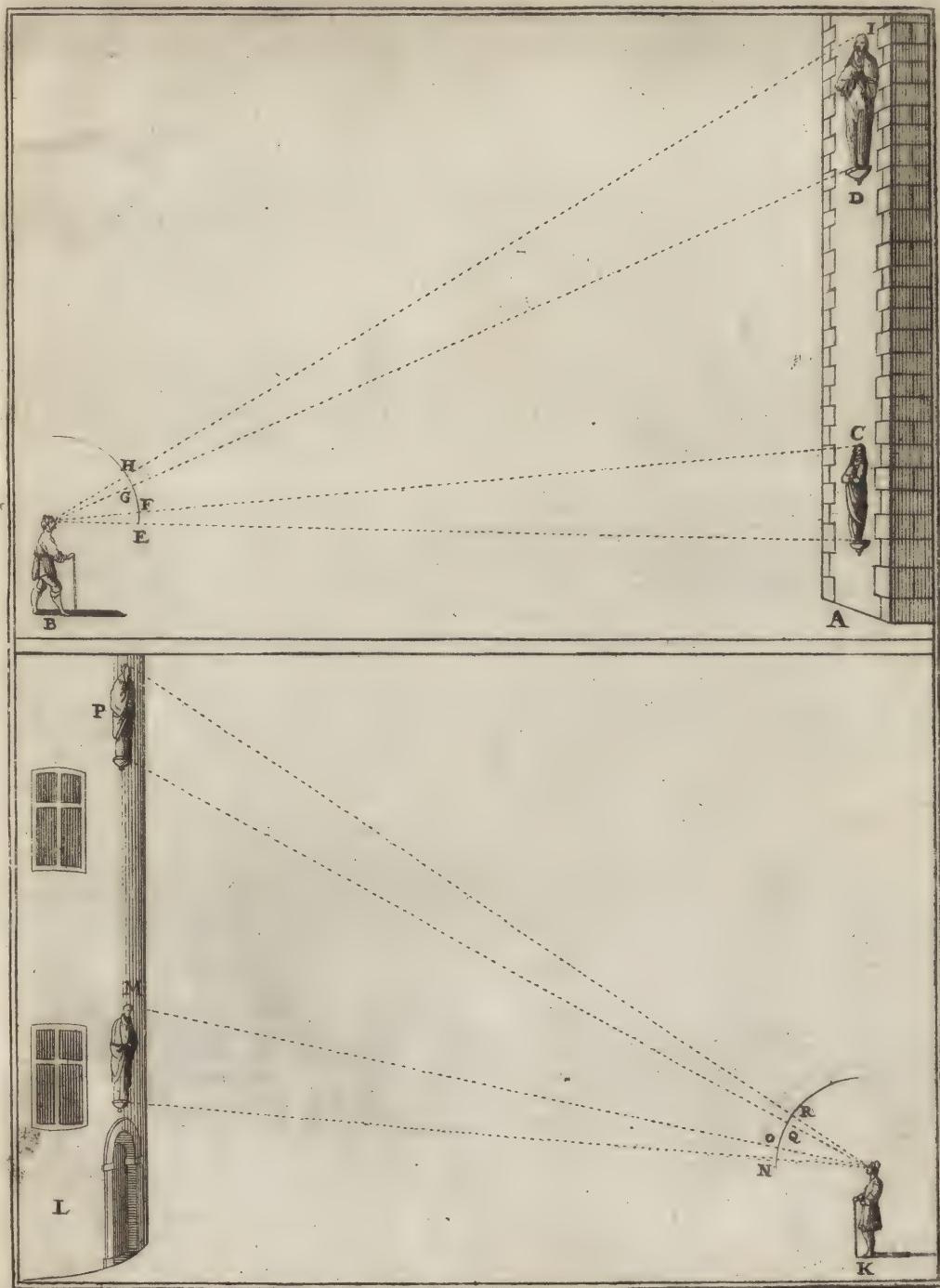


To find in what Proportion equal Figures grow less to the Eye, when placed over one another.

TH E Spectator K having a Quadrant, or part of a Circle, like that of the first Figure B, looks towards the first Figure M of the Tower L ; which there appears of the natural Size. Then taking its Meafure from Head to Foot he marks the Distance thereof on the Quadrant, *viz.* N O. After this, without stirring out of his Place, he directs his Eye to the Head of Figure P, and marks the Angle it gives on his Quadrant, *viz.* Q R. And if there be others still higher, he would take them all after the same manner, and lay them down on his Quadrant.

Now to find the Difference between the one and the other take the Angles or Distances of each in your Compasses, and you will find that the highest gives the smallest Angle ; and of consequence shew the smalleſt Figures to the Eye ; so as the Figure P shall only appear half the Figure M, tho' the one be in reality as big as the other. If you ask the Reason, we anſwer, that the Angle of Figure P is only half that of the Figure M ; as you ſee that Q R is only half of N O, or nearly ſo.

By this Knowledge we may arrive at that above, and by that above we can come at this : For if M and P be the ſame Magnitude, and yet P only appear below to be half of M, we may ſecurely ſay, that to make P appear as big as M, it muſt be twice its preſent Magnitude. The fame may be ſaid of the upper Figure, where D, which is double to C, appears no bigger to a Spectator in B than C does. It might be added, that unleſs D were bigger than C, it would only appear half as big ; ſo that one Rule is the reverſe of the other. Both the firſt and ſecond Rules are best put in practice by the little Foot, as the Figures hitherto have been ; by which we come at the Difference and Proportion of Figures as ſecurely as if they were taken from the Life by a Quadrant.





Measures for elevated Figures.

FR OM what we have been saying of the Diminution of Figures when placed on high; we are to take our Measures in Proportion, for such as are to be rais'd in Paintings, whether they be placed on Mountains, Houses, or above the Clouds in the Air. The two Rules we have now to give, will render the Method extremely easy.

For the first, I suppose the Man A to be six Foot; which Height I set off several times on a Perpendicular B, over the Base-Line; and from the several Divisions 6, 12, 18, &c. draw Lines to the Head of the Figure A. Then setting one Point of the Compasses in the Point A, with the other I describe the Arch C D, and the Intersections that Arch makes with the Rays, are the Measures to be given the Figures. Thus, if I would have a Figure appear forty two Foot high; I take E D, which cuts the two last Rays, and set it off to F, which is forty two Foot above the same Base-Line A B. If another be requir'd thirty Foot high; the Distance G H must be took, which cuts the Rays 30, 36, and gives the Height of the Figure P; and so of the rest. The main Point is the approaching or receding of the Line B; which must always be the Distance between the Spectator and the Object, *viz.* here, thirty Foot, or thereabout.

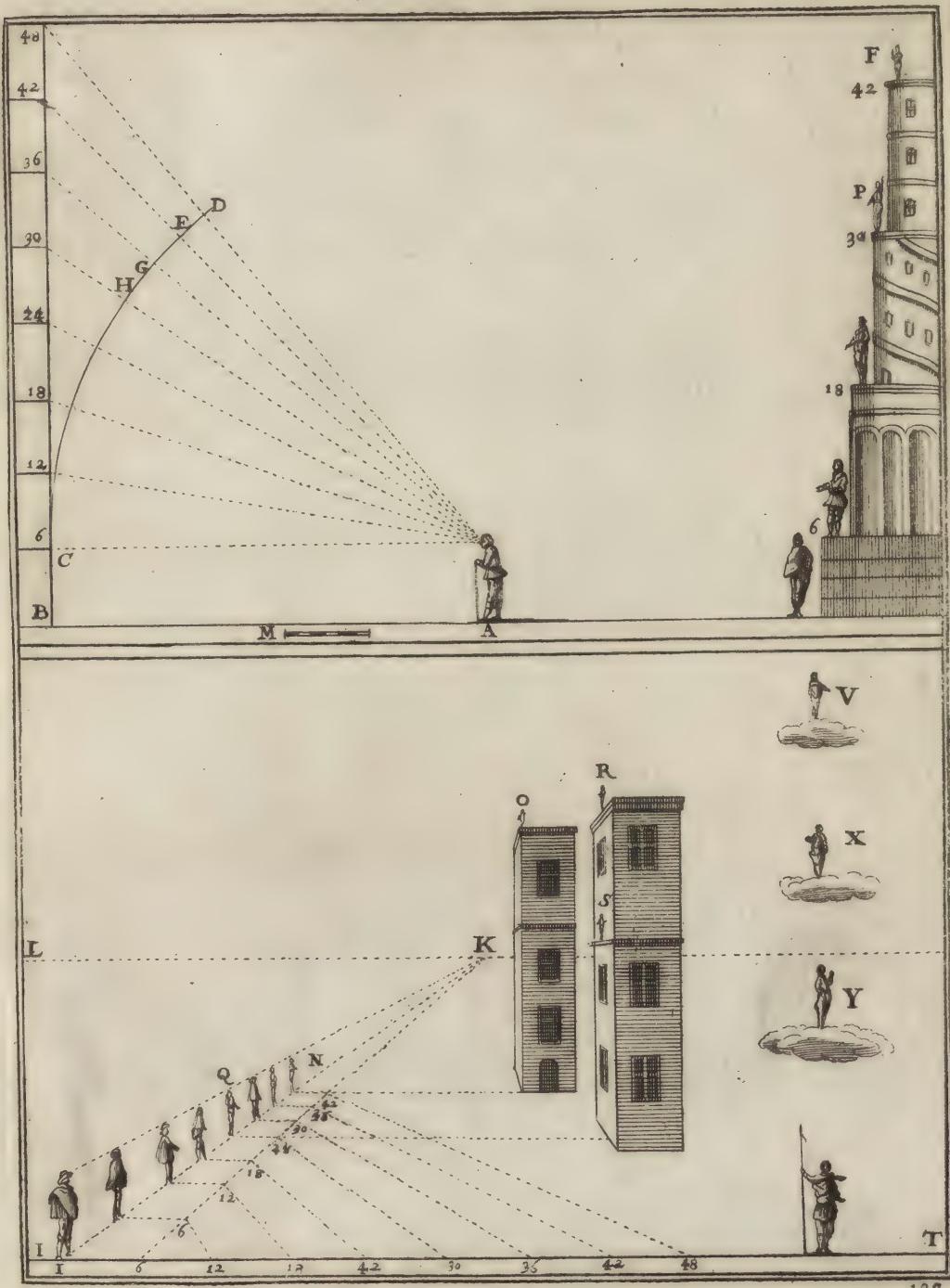
For the second Rule: Instead of the Line B, us'd in the first Figure, I here put the Division from six Feet to six on the Base-Line I T. The two first Points I and 6 are to be drawn to the Point of Sight K. Thus between the two Rays I K, and 6 K, we have the Measure of six Foot, which is the Height to be given the Figures. Then from all the other Divisions 12, 18, 24, 30, &c. draw Lines to the Point of Distance L, and in the Intersections made with the Ray 6 K, draw little Parallels to the Base-Line, between the Rays I K, and 6 K. These Parallels will give the Heights of Figures unequally high, but at the same Distance. Which may be prov'd by comparing the Measures of the first Method with those of the second.

If it be ask'd how much each Figure is diminish'd from the first, which is six Foot high, you need only to take the Height of the Figure requir'd in your Compasses, and set it off on the little Scale M, and the Question is solv'd. Thus, having taken the Height of the Figure B, and set it on the Scale M, it gives four Feet; which shews, that a Figure six Foot high, rais'd thirty Foot, will only appear to be four Foot. The Heights or Diminution of the rest are found by the same Operation; provided the Distance be the same with that of these. If the Distance be chang'd the Proceeds must be begun anew.

The Figures V, X, Y, which are in the Clouds in the second Figure underneath, are of the same Height and Proportion as in the first Figure. They are only here added to shew, that tho' the Method be different the Effects are the same.

What has been said as to the Heights and Diminutions of Figures on the Base-Line A B in the first Method, and I T in the second, must be observ'd in Proportion as they are sunk farther behind: And the highest must have the same Relation to those under Ground which are in the same Line, as this F P to that A. Thus, in the second Rule, if over-against the last Figure N there were another Figure O, placed on a Tower forty-eight or fifty Foot high, and its Magnitude requir'd, it must be put in the same Proportion as N has to I. And inasmuch as the last N only contains two and a half of the six Parts which I contains, this O upon the Tower must only have two and a half of the six Parts in the Figure N. If I would have another Figure, R, on another Tower, forty-eight or fifty Foot before the Figure Q, I take two Parts and a half of the Figure Q for the Height of the Figure. If another were requir'd in S, which is thirty Foot high, in the same Tower he must take four of the six Parts of the Figure Q, that is, four Foot; as already mentioned in the first Method between the Rays G and H.

What renders this Rule the more valuable is, that all the Proportions of Figures may be learnt by heart. For whoever would be at the trouble of making this Measure, where he might add more Parts, they would serve him for ever; and he would render them so familiar, that in a little time he would tell you off hand, that if you are thirty five Foot distant, and the Figure six Foot, or six Parts high, when on the Ground, another, that shall be of the same Size, will only appear five Foot and a half when rais'd to the Height of twelve Foot; only five, if rais'd eighteen Foot; only four and a half, if twenty-four Foot; only four, if thirty; only three, if thirty-six; and only two and a half, if forty-two: And so on, by six and six, to any Number at Pleasure.







M E T H O D S
Of finding the
NATURAL SHADOWS
O F
O B J E C T S
Both by the
SUN, CANDLE, TORCH, and LAMP.





Origin of SHADOWS.

TO define a natural Shadow, we do not call it an absolute Privation of all Light, for this would be to form a perfect Obscurity, wherein Objects would be no more seen than their Shadows: But we mean by *Shadow*, a Diminution of Light, occasioned by the Interposition of some opaque Body, which receiving and intercepting the Light that should be cast on the Plane it is placed on, there gives a Shadow of its own Form. For Light being of a communicative Nature, diffuses itself on every Thing not hid from it, particularly on every Thing that is plain and smooth. But where there happens the least Elevation, a Shadow is produced, which exhibits the Figure of the illumin'd Part on the Plan.

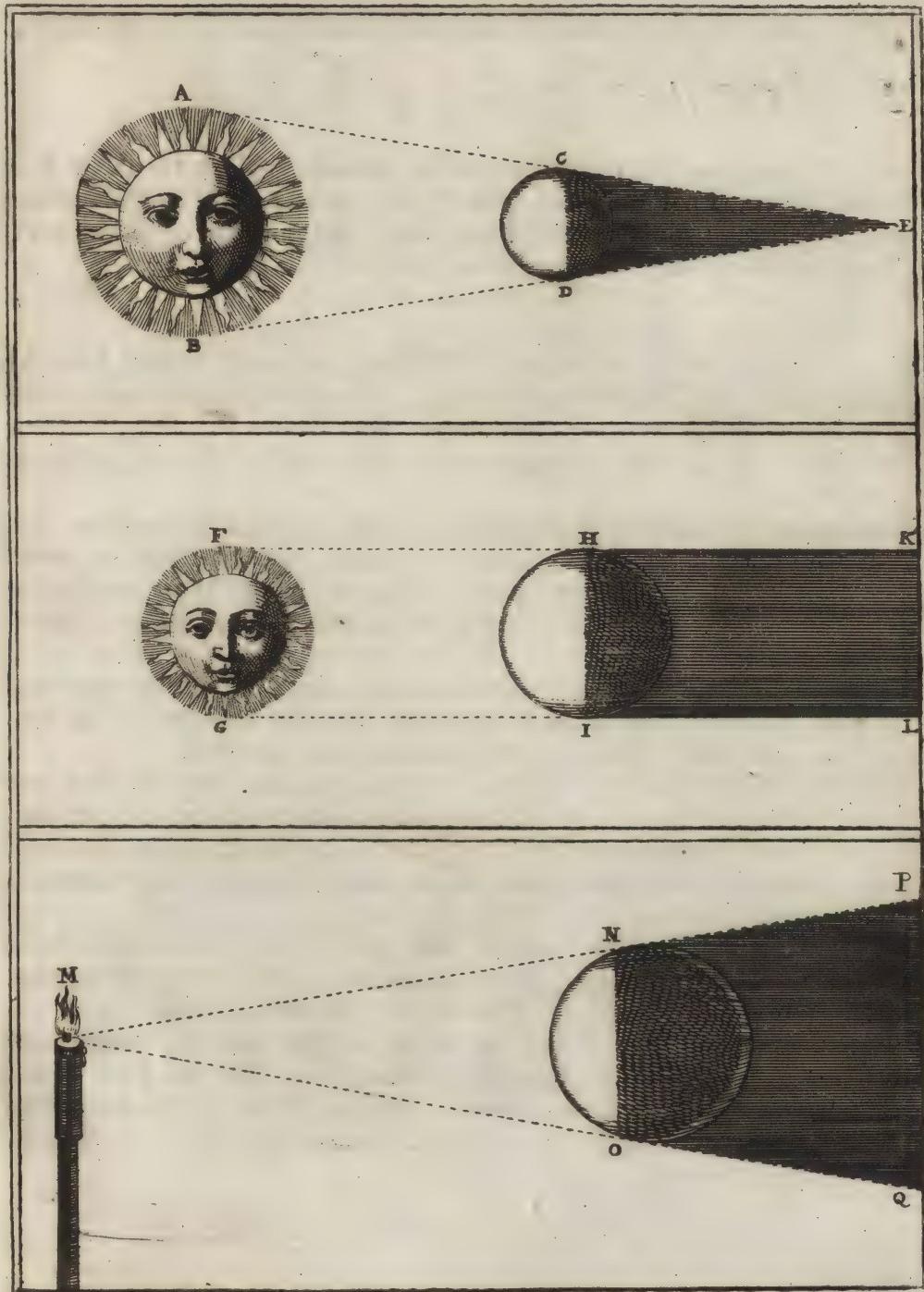
The Diversity of Luminaries occasions a Difference of Shadows; for if the Body that illuminates be larger than the Body illumined, the Shadow will be less than the Body. If they be equal, the Shadow will be equal to the illumined, and if the Luminary be less than the Object, the Shadow will be continually enlarging as it goes farther off.

The better to comprehend this, we here add three Figures, which may serve as a Foundation for all the Rules to be advanced hereafter.

The first shews, that the luminous Body A B, being larger than the illumined C D, enlightens more than half the Object, and gives a pointed or conical Shadow, whereof the Luminary is the Base. This Truth is evinced in an Eclipse of the Moon, which is rarely quite covered by the Shadow of the Earth, tho' the latter be above forty Times the bigger. The Reason is, that the Sun, which is the Luminary, is one hundred and sixty Times bigger than the Earth, which therefore it illuminates more than half, and of Consequence makes its Shadow terminate in a Point.

The second having the luminous Body, FG, equal to the illumined HI, half the Object is enlightened, and its Shadow projected parallel, H I K L.

The third shews, that the Luminary, or Light, M, being less than the illumined N O, the latter is not half enlightened. And of Consequence the Shadow N O P Q enlarging as it recedes farther from the Object, makes a Pyramid, whereof the Luminary is the Point, or Vertex.





Of the Difference of Shadows.

FROM what has been observed in the preceding Page we draw this Conclusion, That the same Object may project Shadows of divers Forms, tho' still illumined on the same Side, the Sun giving one Form, the Torch another, and the Day-light no precise Form at all.

The Sun always makes its Shadow equal to the Object, that is, projects it parallel-wise, as in the first Figure.

How this Method is to be put in Practice, and each Object have its natural Shadow, shall be shewn hereafter. 'Tis certainly of Consequence to all Painters, Engravers, &c. to observe these Rules precisely, and not take the Rules for Candles, Lamps, or the like, in Lieu thereof, as is too frequently done,

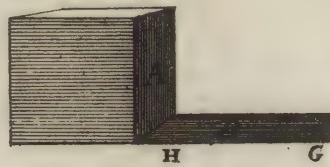
The Shadow of a Torch or Flambeau, is not projected in Parallels, but in Rays proceeding from a Center; whence, the Shadow is never equal to the Body, but always bigger, and grows bigger as it recedes the farther. This is shewn in the second Figure, where the Shadow is larger than in the first, tho' the Cubes of the one and the other be of equal Breadth and Height. It appears, therefore, a gross Abuse, to represent the Shadow of a Torch like that of the Sun, and the Shadow of the Sun like that of a Candle, when the Difference is so considerable,

There is a third Kind of Shadow, neither produced by the Sun nor a Torch, but only a fine sunny Day, which wanting Strength to finish and define its Form occasions a Dimness near the Object, as in the third Figure. Now for this there is no certain Rule, but every Body conducts it at Discretion.

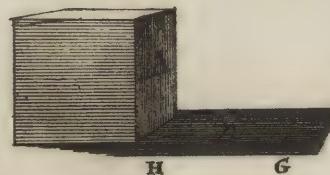
All these Shadows, both those of the Sun, of the Torch, and of the Day-light, must appear darker than the Parts of Objects not illumined. Thus A is less dark than B, by Reason A receives the Reflexion of the Brightness around it, and B has no Reflexion but from A, which itself is in Obscurity. It must be observed by the Way, that the Part of the Shadow most remote from the Object is still darker than that nearest it; as G is darker than H, by Reason A cannot communicate the little Reflexion it receives, as far as G, tho' it does to H.



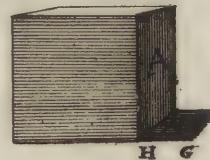
1 Figure



2 Figure



3 Figure





To find the Form of the Shadows.

IT may be remembred, that at the Beginning of this Book, Perspective was defined, The Art of representing Objects which are on the Ground, or a horizontal Plane, upon a Plane perpendicular to the Horizon. But in the Busines of Shadows it is quite the reverse, since we there conceive a Body raised over the Plan, which being illumined, casts its own Shadow on the Plan; as we find the *Body A* gives a Shadow *B*, on the Plan.

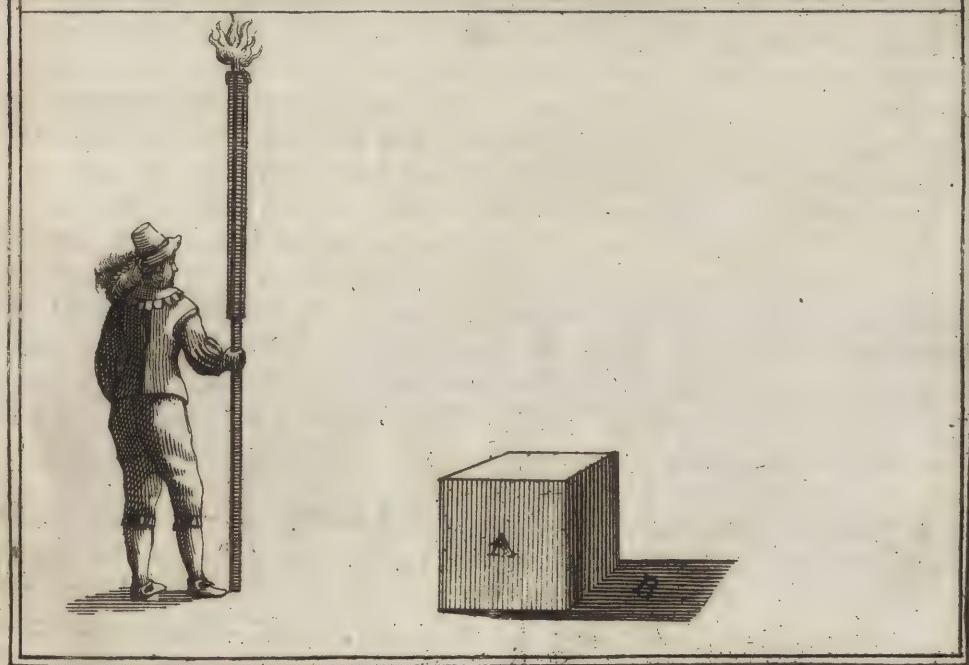
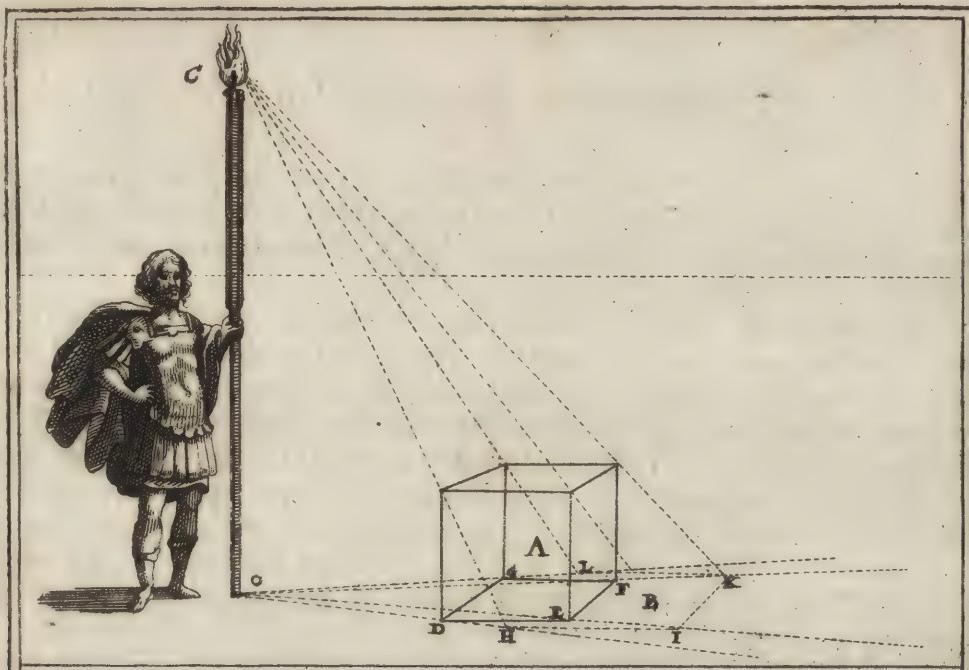
To find a Shadow two Things are supposed, *viz.* Light and a Body. Light, tho' quite contrary to Shadow, is yet what gives it its Being, as the Body, or Object, is what gives its Form and Figure. *What we have here is to consider the Shadows, the Reader being supposed already instructed in what relates to putting the Bodies in Perspective.*

To conceive the Nature of Shadows more clearly, and render the Practice more easy, it must be observed, that there are two Points to be made use of. One of them the Foot of the Light, which is always taken on the Plan the Object is placed upon, the other, the luminous Body: The Rule being common to the Sun, Torch, &c. with this Difference, that the Sun's Shadow is projected in Parallels, and that of the Torch in Rays, from the same Center. We begin with that of the Torch, as leading to a more easy Understanding of that of the Sun, which follows.

We say then, for Example, that if 'tis desired to have the Shadow of the Cube *A*, here represented in *B*, Lines must be drawn from *O*, the Foot of the Luminary, through all the Angles of the Plan of the Object, as here *OD*, *OE*, *OF*, *OG*. Then other Lines are to be drawn from the Point of the Light of the Torch *C*, through all the same Angles, till they intersect the Lines from the Point *O*. Thus, having drawn a Line from *O* through the Angle *D*, another must be drawn through the same Angle, intersecting the former in *H*, which Point *H* will be the Shadow of that Angle. And if from the same Point *C*, the same be done through all the Angles, the Lines of the Plan will be cut in the Points *H*, *I*, *K*, *L*, which being connected together by right Lines, you will have the Shadow of the Cube, as is shewn in the Figure above, and more distinctly in that below.

PRACTICAL.

131



132



Shadows from the Sun.

THE Sun, that magnificent Luminary, being vastly larger than the whole Globe of the Earth, as has been already intimated, must give all its Shadows pointed, by Reason it always illuminates more than half of them.

In Consequence of this Demonstration we might conclude, that all the Sun's Shadows must be less than the Bodies that project them, and diminish more and more as they recede farther and farther. Now this would be true, were there any Relation between the illumin'd Body and the Illuminer; but as all Objects on the Earth are so small, in Comparison of that Star, the Diminution of their Shadows is imperceptible to the Eye, which sees them always equal, *i. e.* neither broader nor narrower than the Body that forms them. On this Account all the Shadows caused by the Sun are made in Parallels, as is shewn in the second Figure of this Treatise.

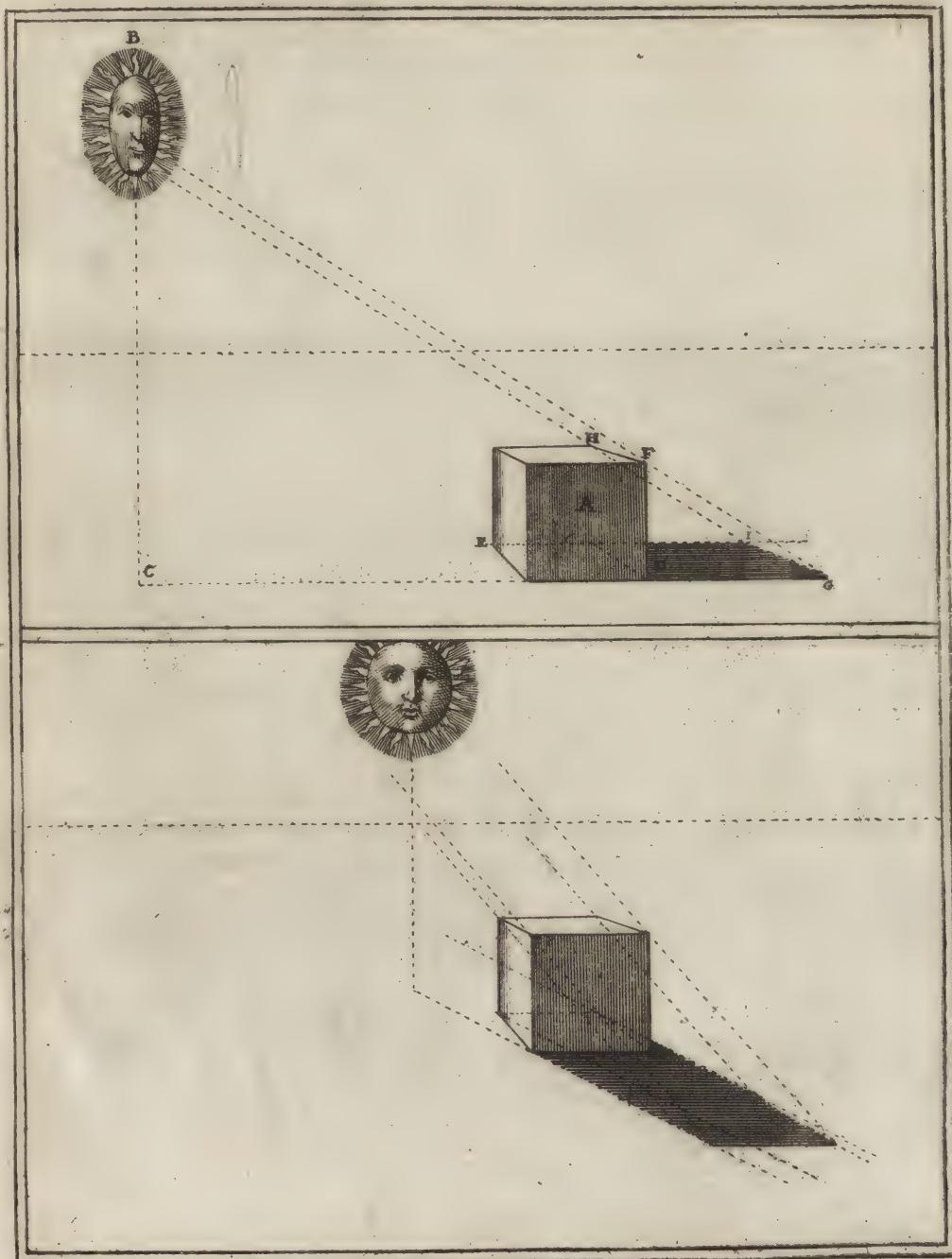
From the whole it appears, that to find the Shadow of any Body whatever, opposed to the Sun, a Line must be drawn from the Top of the Luminary perpendicular to the Place where the Foot of the Luminary is to be taken, and thro' this Place an occult Line to be drawn through one of the Angles of the Plan of the Object, and another from the Sun to the same Angle; the Intersection of the two Lines will express how far the Shadow is to go. All the other Lines must be drawn parallel hereto.

For an Example, to take the Shadow of the Cube A, the Sun being in B, from the Bottom of the Sun C, which is, as it were, the Foot of the Light, draw a Line thro' one of the Angles of the Plan, as CD. Then from the other Angles E, draw Parallels to this Line. And to find the Extreme of the Shadow draw a Line from the Sun, B, through the Angle F, cutting the Line CD in G. Then drawing a Parallel to this Line, through the Angle H, it will cut the Line E in the Point I, and give the Shadow of the Cube, DGI.

If you desire to have the Shadows cast forward, or any other particular Way, you have only to determine the Place of the Sun, and the Point beneath it, to draw the Lines of the same Angle, and the other Lines parallel thereto. The Method is the same as in the former Case, so that it needs not be repeated. The Figure shews the rest.

PRACTICAL

132



132

M m



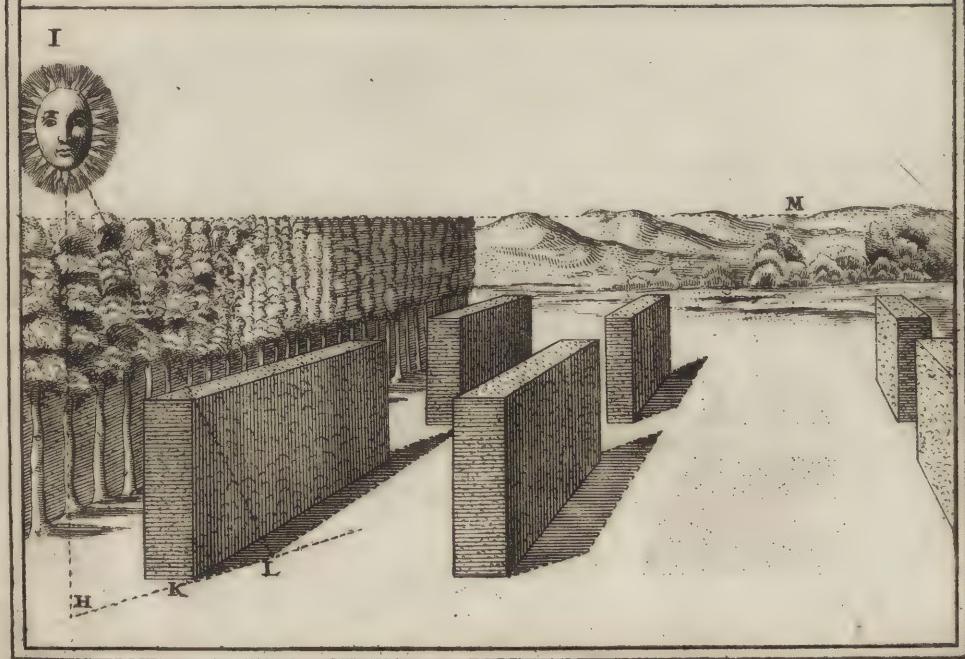
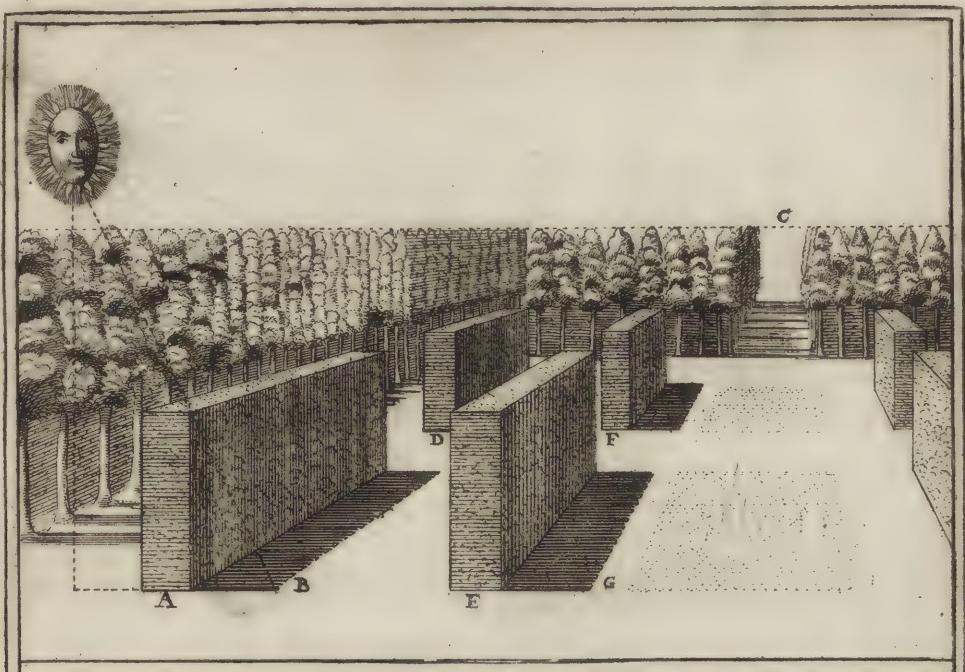
The Shadows of the Sun are equal in Objects of the same Height, tho' at a Distance from each other.

EXPERIENCE teaches us, that several Styles or Elevations of the same Height, remov'd to a distance from each other, do yet project equal Shadows at the same time: We say in the same time, for they are lengthening and shortning, in proportion as the Sun comes nearer or recedes farther off; one or other of which he is continually doing.

For this reason, when the Shadow of an Object is to be cast any way, you must determine the Place of the Sun, and the Point underneath, to draw two occult Lines from the same, for the Extremity of the Shadow; as here the Pallisade A gives the Extreme of its Shadow in B: And if from this Point B, you draw a Line to the Point of Sight C, this Line B C will be the Shadow of the Pallisade D, as well as of that of A, and of all the rest in the same Line to the very Point of Sight. In Effect, it must be held for a certain Maxim, that Shadows always retain the same Point of Sight as the Objects.

On the footing of this Observation, that Objects of the same Height give equal Shadows, if you would give the Shadow of the Pallisades E, F, which are the same Height as A, D; take in your Compasses the Distance A, D, and set it on the Foot of the Pallisade E, by which you will have E G; then from G draw a Line to the Point of Sight G: And thus you are to proceed, though the Walks were infinite.

If the Light come from the Middle, or Fore-part, as in the Figure underneath, the Method must not be alter'd; but only the Foot, or Bottom of the Sun, to be brought nearer or farther off, and Lines drawn from each thro' an Angle: Thus H and I give the Extreme of the Shadow of the Pallisade K, in the Point L; and from L a Line must be drawn to the Point of Sight M: Then from all the Angles of the Plan of the Pallisade, Parallel's to be drawn to the Line H, as far as the Ray L M; and the natural Shadow of the same Pallisade will be given.





Of Shadows, when the Sun is directly oppos'd to the Eye.

AS often as the Sun is before the Eye, that is, directly over the Point of Sight, the Sides of the Shadow it produces will be Parallels, as all the visual Rays are. For this Reason, the Point of Sight is always to serve for the Foot of the Light ; and the other Ray, that is to determine the Shadow, will be taken from the Centre of the Sun.

Thus the Shadow of the Cube A being requir'd, draw Lines thro' all the Angles of its Plan B C, to the Point of Sight D, as the Lines B E and C F. Then, from the Center of the Sun, G, draw two Rays, cutting the former in the Points K and L, and passing thro' the Extremes of the Lines rais'd from the Angles B and C; viz. H and I. By this means the Shadow of the Cube will be found B K L C.

The Shadows of the two other Objects, M and N, are found by the same Rule, and so might as many others as should be seen there.

But my Mind suggests, that there might be some Difficulty, if, instead of a Cube, a Pyramid were given ; by reason the Ray from the Middle of the Pyramid, and that from the Sun, passing thro' its Vertex, or Point, only make one Line ; and, of consequence, cannot terminate any Thing for the Shadow of the Vertex of that Pyramid.

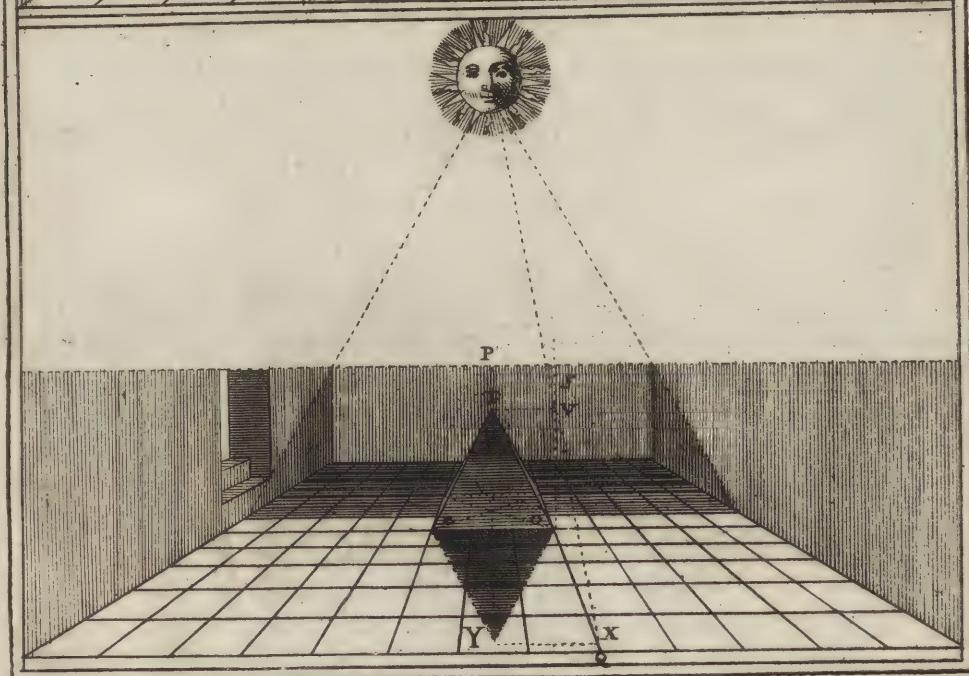
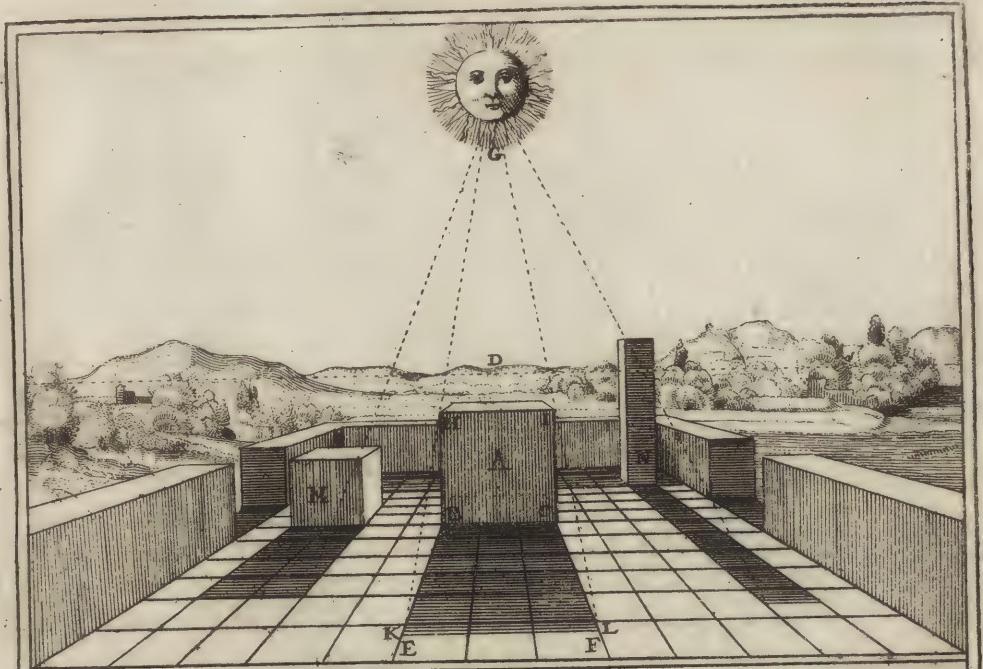
When this happens, draw a Line from the Point of Sight P, thro' one of the Angles of the Plan ; by which means you will have O Q. Then from O erect a Perpendicular O S, and from the Point of the Pyramid T draw a Parallel to the Base, till it cut the Perpendicular O S in the Point V. Draw the Ray of the Sun thro' this Point, and continue it till it cut the Ray O Z in the Point X ; from X draw a Parallel to the Base, as far as the Ray of the Middle of the Pyramid, which will be cut thereby in the Point Y, the Extreme of the Shadow. To Y draw Lines from the Angles Z and O ; and the Triangles Z Y O will be the Shadow of the Pyramid.

The like you are to do for the opposite Face, if it be perpendicular to the Plan ; and the same Rule will serve in all Cases. For Example, if the Point, or Apex, correspond to the Centre of the Plan, draw a Line from the same Center parallel to the Base, and of any Length at Discretion ; and from the End of the Line, as here from O, draw a Line to the Point of Sight, and proceed as before. Which will be a standing Rule, whether the Pyramid be view'd in front or side-wise. And hence you will easily judge what is to be done, if the Point, or Vertex, correspond to any other Ray of the middle of the Plan.

The Walls in the Front of each Figure have their Shadows as already taught in that of the Cube A.

PRACTICAL

134



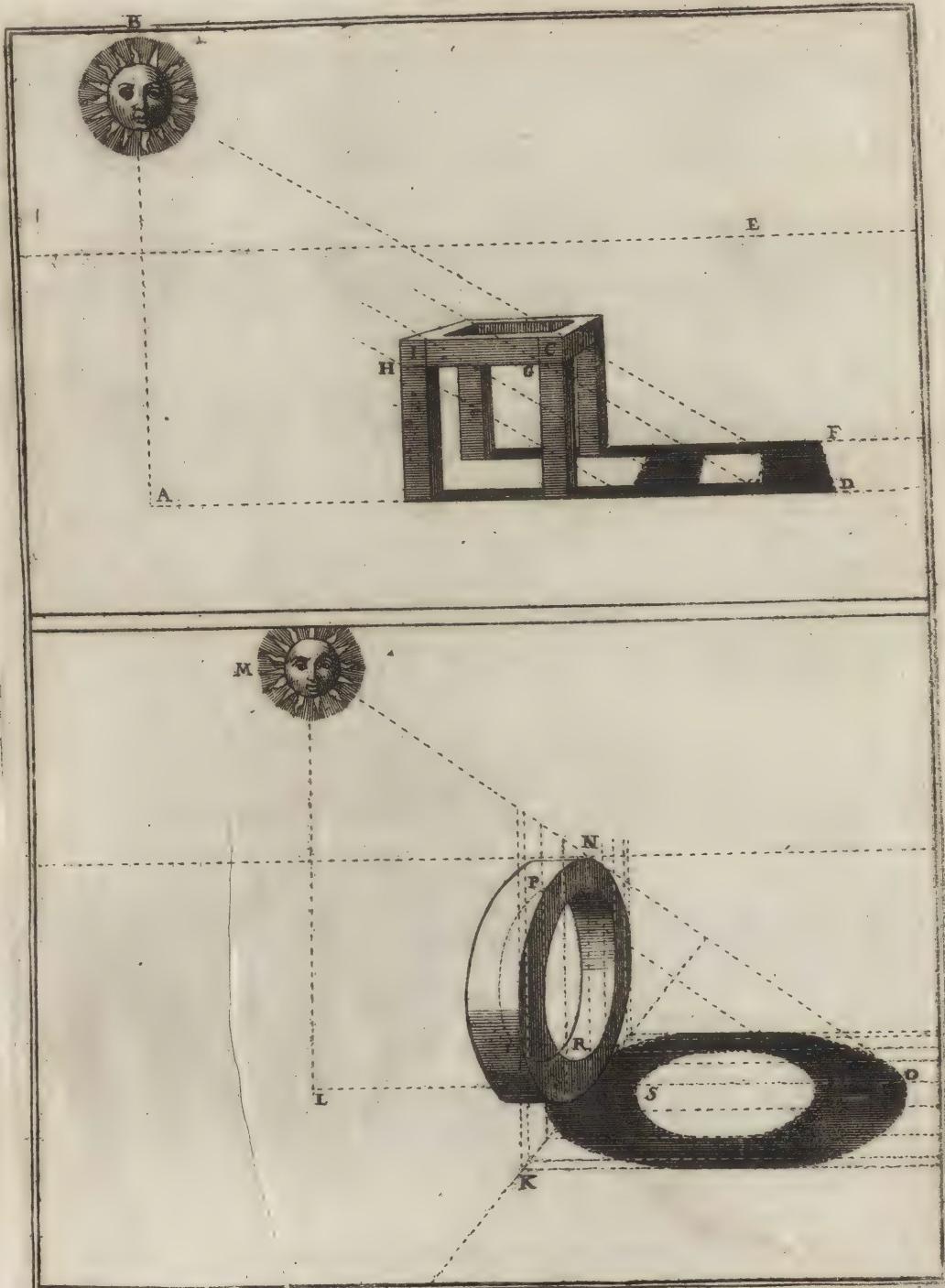
134



For the Shadows of perforated Objects.

WHEN the Object is square, or rectilinear, Lines must be drawn from the Foot of the Luminary through all the Angles of the Plane; then from the Middle of the Sun B, draw a Line to the remotest Angle C, which will cut the Line from A, in the Point D; through which Point a Line must be drawn from the Point of Sight, till it meet the last Line from the Plan F. To find the rest of the Shadows; draw Parallels to the Base BCD, through the Angles GHI; and inasmuch as the Sun illuminates two Sides, or Faces, and makes the Shadow broader, as is shewn in the first Figure, where GC and HI are the Diagonal of the square Pieces; where these Lines drawn through GC and HI cut the Line A, a Line must be drawn to the Point of Sight E; and you will have the whole Projection, or Shadow of the Object.

If it be a round Object, as represented in the second Figure, a Circle must be describ'd, according to the Rule given for Arches in Pag. 62, 63. by erecting of Perpendiculars, &c. And when the Circle is form'd, and its Thicknesses given, from the Bottom of those Perpendiculars, Parallels to the Base must be drawn; as here KL. Then taking L, which is the Parallel of the Middle of the Circle, for the Foot of the Luminary, from the Middle of the Sun, M, draw a Line passing over the Circle N, and continue it till it cuts the Parallel L in the Point O; which will be the Extremity of the Shadow. The Vacuity, or Aperture, of the Rotundo, is found by drawing a Parallel to NO from the Point P, which is the Top of the Object opposite to the Sun, till it cut the Line IO. The rest of the Rotundo will be found by drawing another little Parallel to NO from the Point R, which will give S. The rest of the round Object is found by drawing Parallels to NO, through all the Points of the Circle of Perpendiculars, which are to be continued till they cut the Parallels to the Base-Line; as is here done for that of the Middle, LO. I could easily mark them all with Points, but I am too great an Enemy to Confusion.





Shadows assume the Form of the Planes they are cast upon.

HITHERTO we have consider'd Shadows on an even Plane; being secure that a Person, who understands such, will find no Difficulty in the Practice of the rest which follow: For the Rule is the same in all; and one single Instruction will suffice to shew how Shadows sink and rise according as their Planes are.

To shew that these Shadows are form'd by the same Rule as the preceding ones, draw a Line from the Foot of the Luminary A, through the Plan of the Door B; and another from the Sun C, over the Top of the Door D; these Lines will intersect each other, tho' without the Limits of our Page, and give the Extremity of the Shadow; as already is observ'd of the others. But the Wall E preventing the Line A B from being continued as it should be, if the Plane were even, obliges it to rise, as we see in F G: For this reason the Sun's Ray, which should proceed to meet the Line A B, cuts it on the Wall in the Point G, and there marks the Form or Shadow of the Door; the Top whereof is drawn to the Point of Sight H.

The Shadow of the Object K is cast in all its Length K I, and passes over that other L: And it is to be observ'd, that the Shadow still preserves its Length, though it meets with something between the two: and that the Shadow which passes over any thing assumes the Figure of the same thing; as here the Shadow of M and N, take the Form of the Object L.

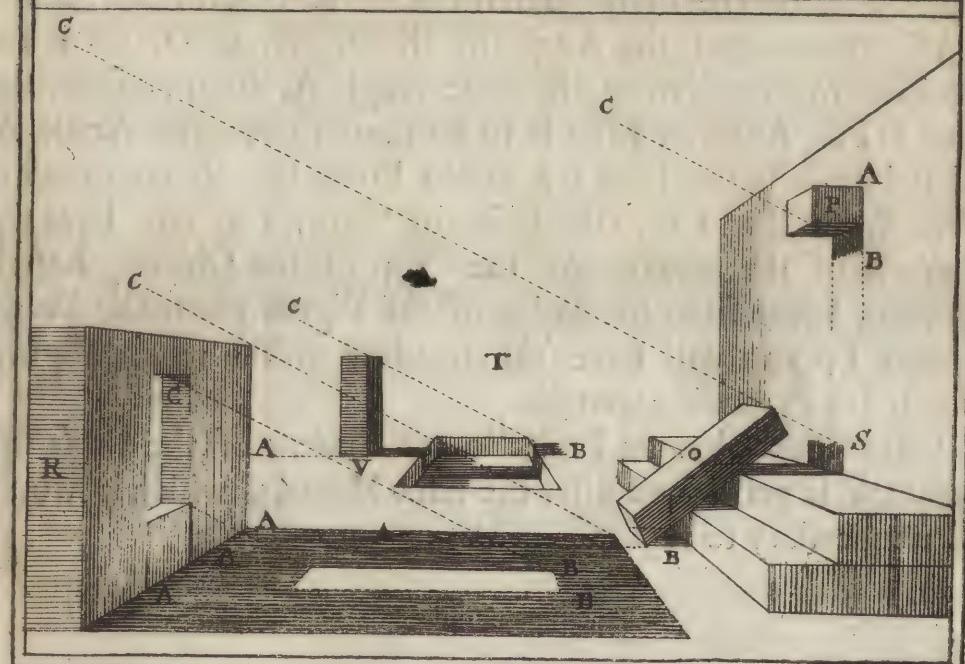
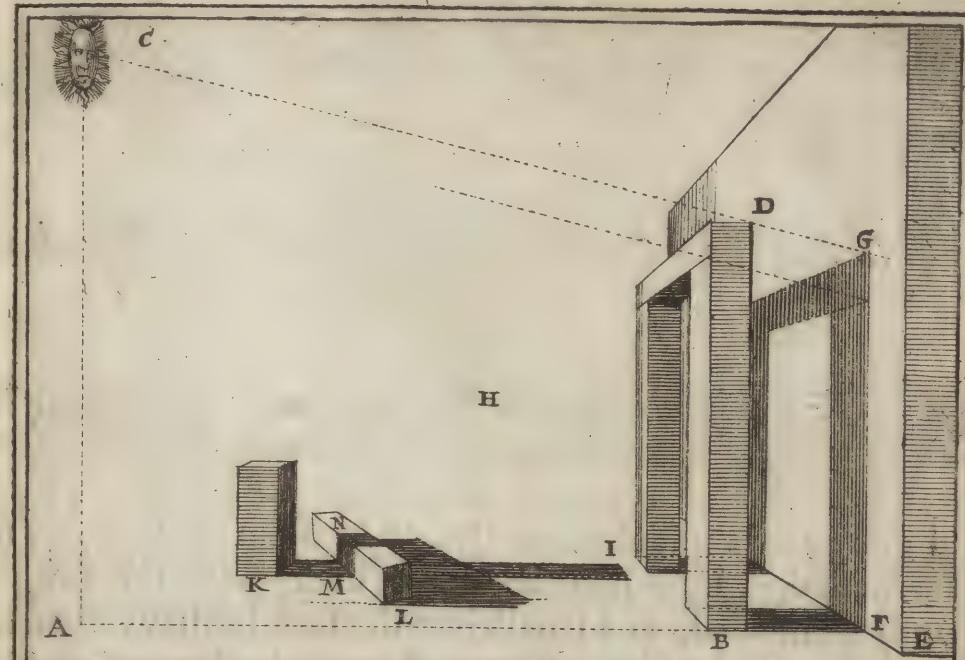
Though I have made the Sun to appear in all my Figures, it must not be imagin'd that he is so near the Objects. My Intention was to shew that the Rays proceed from him when at such a Height, tho' far without the Limits of the Piece. As in this second Figure, which yet has the Line for the Foot of the Sun A B, and that of the Rays of the Sun C; by reason those are always required for finding the Extremities of the Shadow.

The Shadow of the Object O is found by continuing the Line A B, and making it rise over the Steps, and against the Wall, till cut by the Ray in the Point S, by the Rays passing over the Corner of the Object; and from S drawing a Line to the Point of Sight T.

To find the Shadow of the Object P it must be remember'd, which has already been observ'd, that the Foot of the Light must always be suppos'd on the Plan where the Object is placed. Accordingly, the Ray C cutting the little Line A B, shews how far the Shadow of the little Object, P, must go, to be thence drawn to the Point of Sight T.

The Object V casts its Shadow all along, tho' in its way it descends into a Ditch.

The Shadow of the Wall, R, is found by the same Rule as the rest; as appears from the Lines A B, and the Ray C.

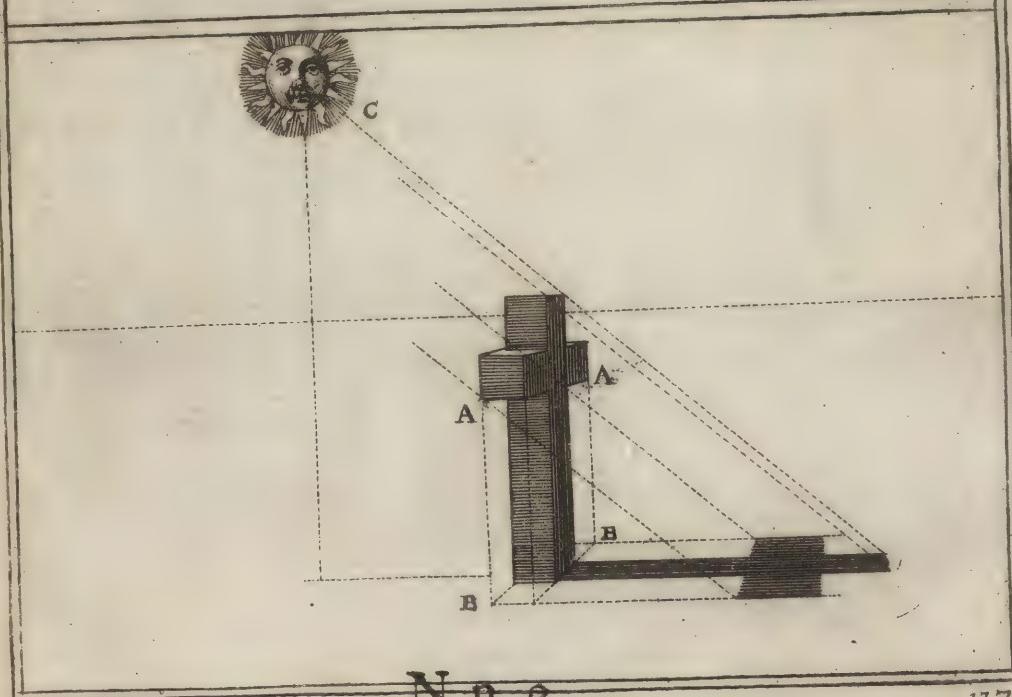
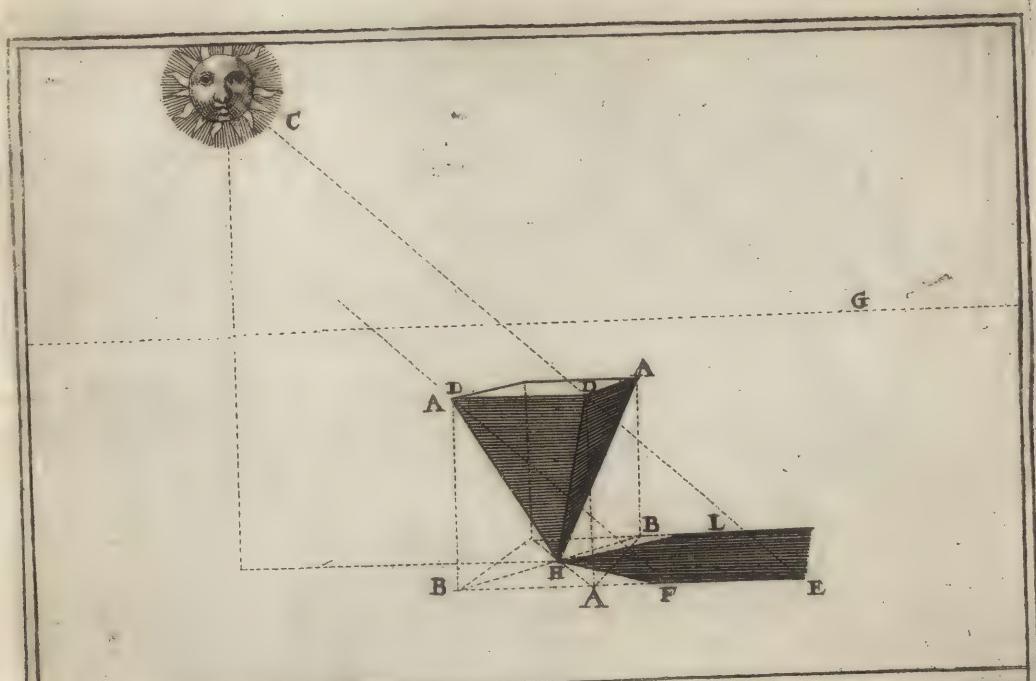




*To find the Shadows of Objects broader at Top than
at Bottom.*

WHEN the Projection or Shadow of a Figure is requir'd, whose Top is broader or wider than the Bottom, as in the two adjoining Figures, the usual Method is, to make a Plan, and draw Perpendiculars, as BA, BA, from the same. The Plan finish'd, a Line must be drawn underneath the Sun, as already mentioned, and Parallels to this Line be drawn from all the Angles of the Plan. Then a Line to be drawn from the Sun C, over one of the Angles of the Object, as D, till it cut the Line of the Plan of the same Angle A, so as to form the Line DF. Another Line is to be drawn over the Angle A, till it intersects the Line BA in the Point F. Then drawing Lines from E and F to the Point of Sight, you will have the Shadow of the Square of the Top of the Object. Lastly, drawing Lines from the Point of the Figure H, to the Points F and L, you will have the Shadow of the whole Figure, which is a Pyramid inverted.

'Tis evident that the Projection or Shadow of the Cross underneath is performed after the same Manner, which it would be unnecessary to repeat.





To find the Shadows of Objects suspended from the Ground.

THE Method is rendered very easy by that just laid down, all you have to do in each being to find the Plan, and from that Plan to draw Parallels to the Line from under the Sun, through all the Angles, and then, from the same Angles of the Objects suspended in the Air, to draw other Lines, cutting those drawn from the Plan; by which Means you will find the Extremes of the Shadows, as already mentioned under the preceding Figures.

I am clearly persuaded, therefore, that my Reader would easily conceive any Thing that I can do as to Shadows made by the Sun, without any farther Explanation of the Figures here annexed, as being all intelligible, and performed by the Rules already taught.

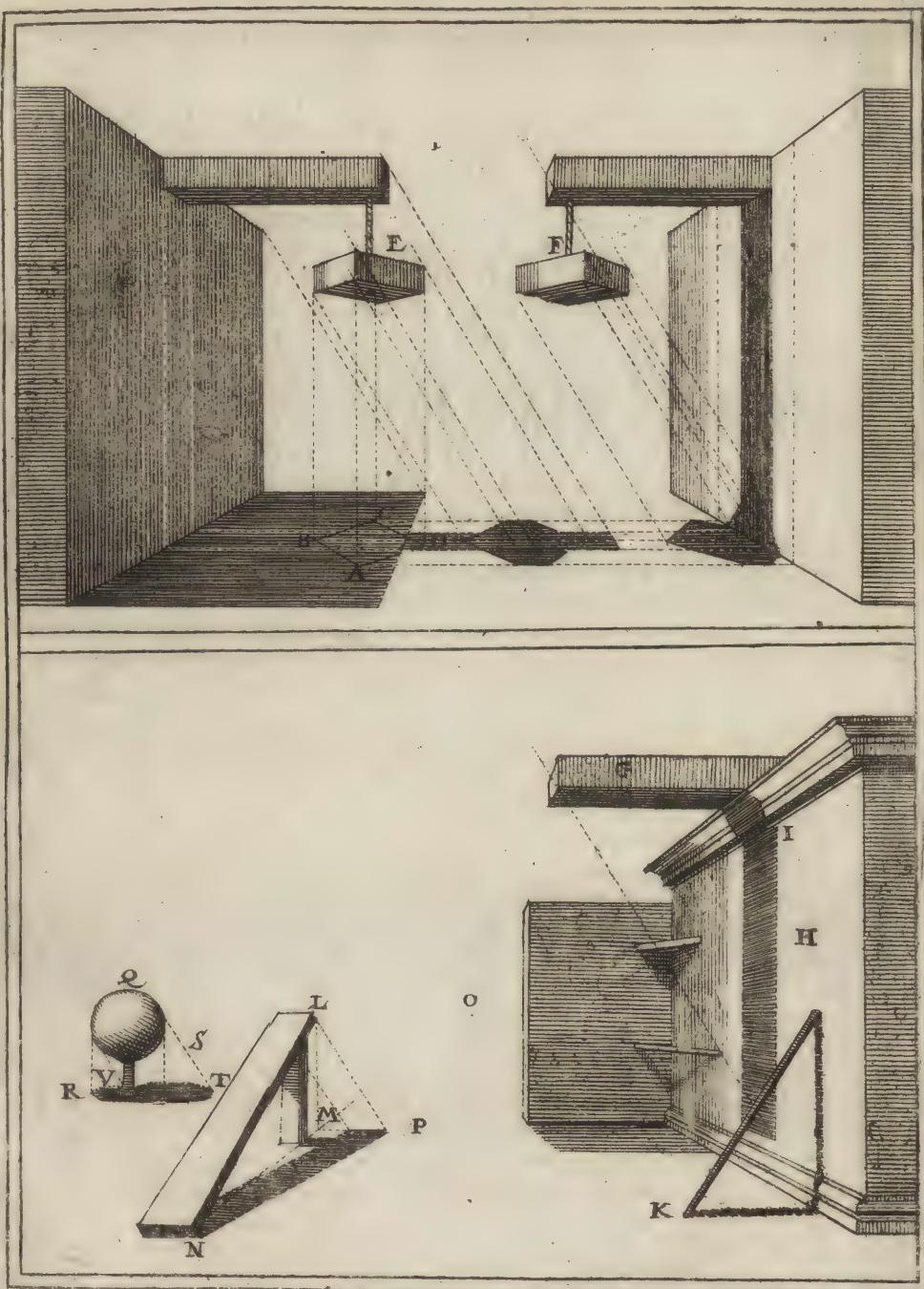
However, as every Thing has something particular in it, it may not be improper to take Notice thereof, that there may be nothing but what is easily understood.

I observe then, that in the first Figure the Plan A B C D is alone made use of, to find the Shadows of the Objects E F, by Reason they are both on the same Line, and of the same Height.

In the second, it must be observed, that the Piece of Wood G casting its Shadow on the Wall H, that Shadow makes the same Figure at the Cornice I underneath. And the same is observable of the Stick K, raised against the Wall H.

To find the Shadow of the Board L, the Rule already delivered for Objects broader at Top than at Bottom, must be remembered; for having drawn the Perpendicular M, where it cuts the Ray N O, you must draw the Line from underneath the Sun M P. Then from the Board L, drawing a Line to cut the Line M P, the Point of Intersection will be the Extremity of the Shadow.

The Shadow of the Globe or Ball Q is likewise found by letting fall two Perpendiculars, of which the Plan is to be formed, then through the Center of this Plan drawing a Line from beneath the Sun, R, and a Tangent from the Sun, as Q S, till it cut the Line R in the Point T, and lastly, another, as V, cutting the same Line R: This Interval T V will give the Extent of the Shadow of the Ball.





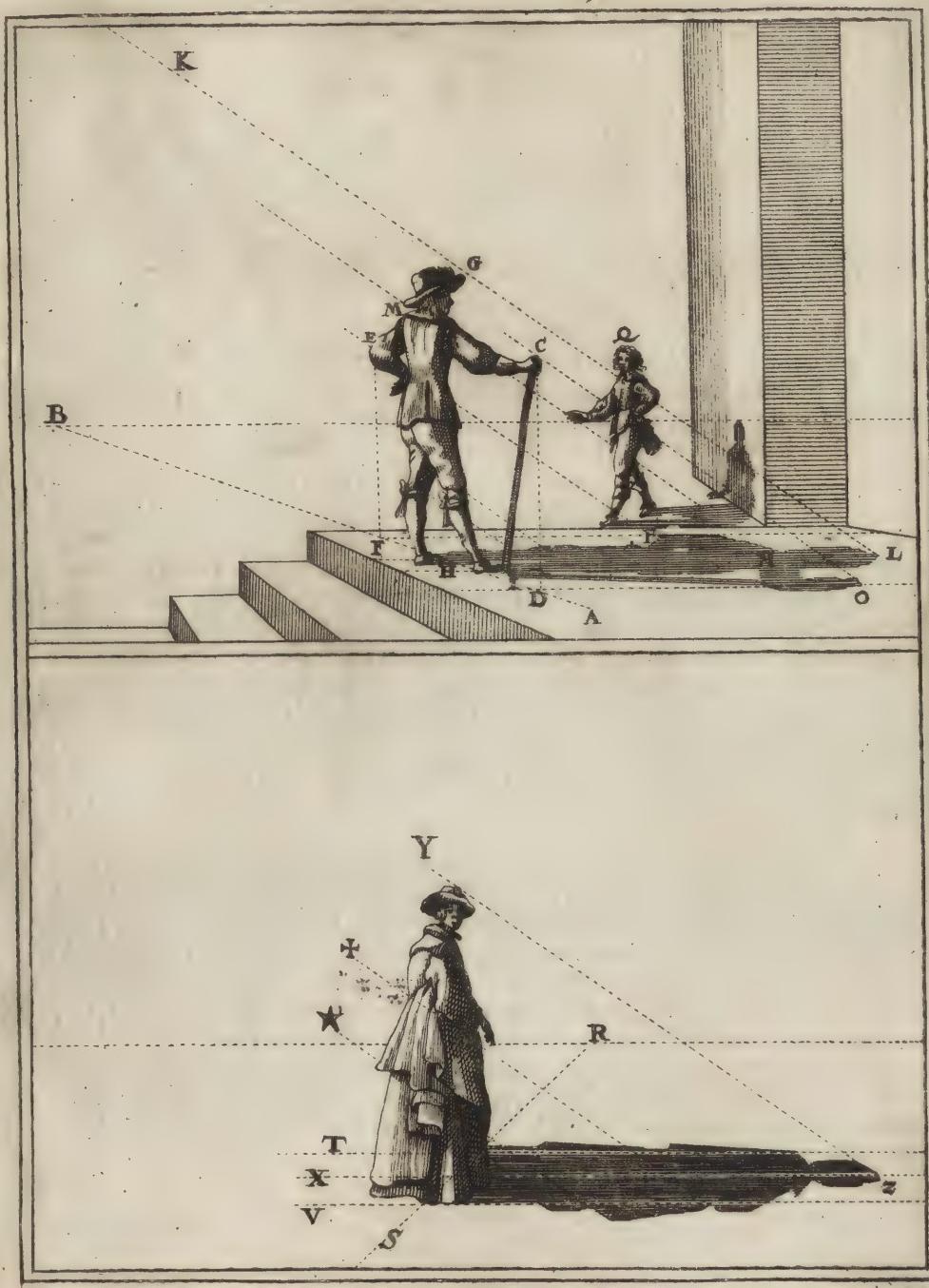
To find the Sun's Shadow for human Figures.

THE Shadow of these Figures is found by the same Methods as those of other Bodies, that is, by Parallels both from underneath the Figure, and from the Sun; with this Difference only, that the Shadow of other Bodies, or Objects, is found by Means of their Plan, whereas Figures have none. But in Lieu of such Plans, a Line must be drawn underneath the Figure, and on this Line, the several remarkable Points of the Figure to be let fall perpendicularly, which Line is to serve as a Plan.

For an Example, *in a Figure naked, or dressed without a Cloak or Gown*, as the first Figure hereto adjoining, with its Back towards us; from under its Feet, as A, draw a Line to the Point of Sight B, and to this Line A B draw occult Lines from all the Points that may contribute to the true Shadow; thus from the Hand C, let fall a Perpendicular, cutting the Line A B in the Point D, and from the Elbow E let fall another to the Point F, and a third from the Head G to the Point H, and from all these Points D F H, as also from the End of the Staff I, draw Parallels to the Base Line.

Then, having determined the Height of the Sun, a Line must be drawn from the same, as K, passing over the Edge of the Hat G, and continued till it cut the Line H in the Point L, which will be the Extreme of the Shadow. And again, from the hind Edge of the Hat M, draw a Parallel to K G L, till it likewise cut the Line H in the Point N, these two Points N and L, will be the Shadow of the Hat. A third Parallel must be drawn thro' the Point C, till it cut the Line D in the Point O, this Point O will be the Shadow of the Hand that holds the Staff; drawing therefore a Line from the Point O, to the Point I, the Line O I will be the Shadow of the Staff. A fourth Parallel to be drawn thro' the Point E, which cutting F in P, will be the Shadow of the Elbow. The same do from all the other Parts, as the Knees, the Feet, &c. These several Points connected together, give the Shadow of the whole Figure. The Shadow of the little Figure Q is done by the same Method. I have not expressed all the Points and Parallels therein, in order to avoid Confusion.

To find the Shadows of Figures clothed in long Garments; draw a Line from under their Feet to the Point of Sight, as here the Line S R, and thro' the Bottom of the Robe draw two Parallels to the Base Line, each Way, as the Lines T and V, and between the two, another Line X for the Middle of the Figure. Then from the Top of the Head draw a Line Y, for the Ray of the Sun, to be continued till it cut the Line X in the Point Z; which Point Z will be the Extreme where the Shadow is to terminate. The rest of the Shadow will be drawn between the two Parallels T and V. If any Thing comes over them, as the two Plaits, or Folds, † and *, they must be drawn by Parallels to Y Z, till they cut the Ray V. And thus † gives the Shadow of the Elbow, and * that of the Folds of the Gown.

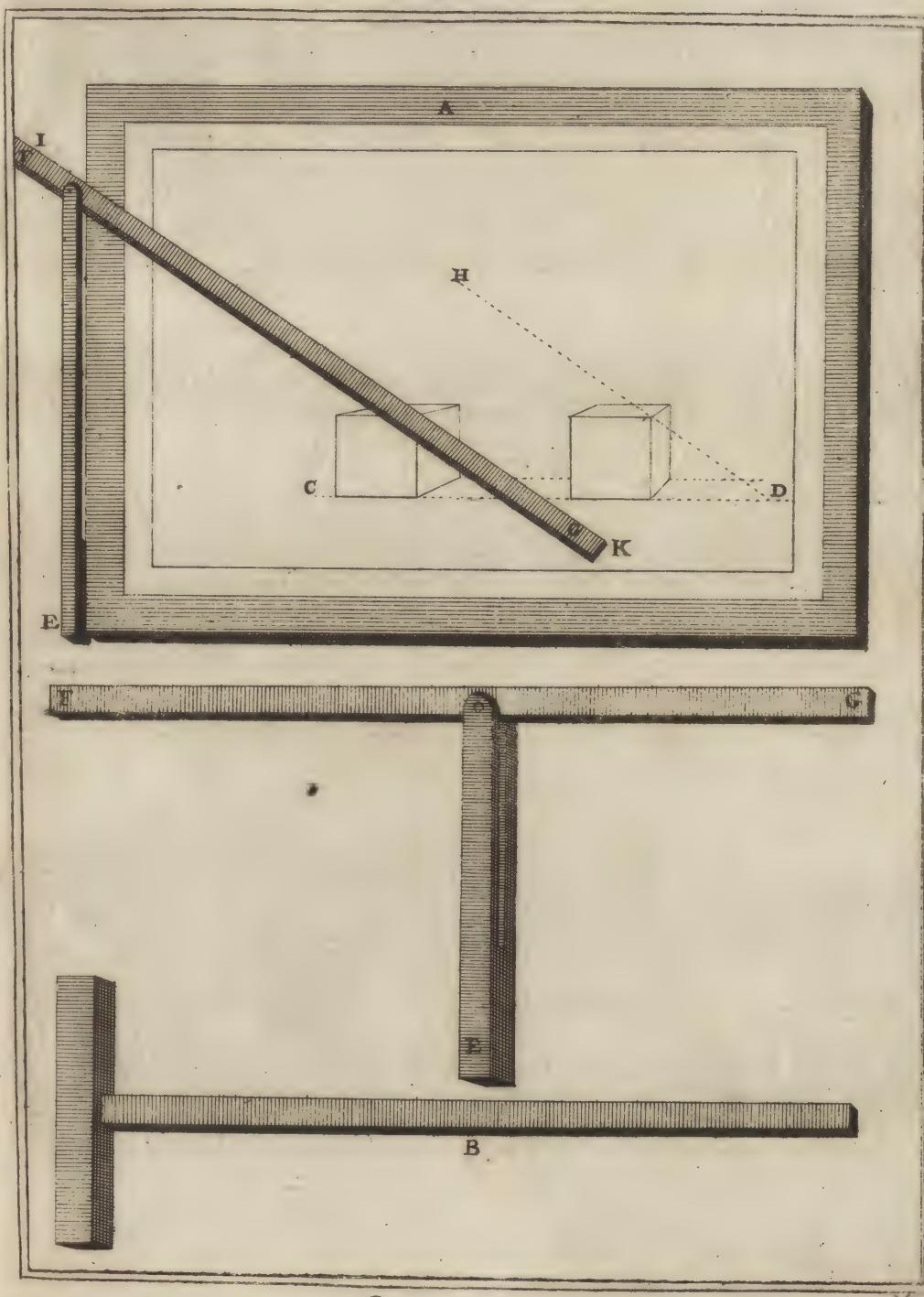




An easy Method of finding the Shadow of the Sun.

WERE I here to add the Shadows of all the Objects that might be given, it would be a Work without End, Objects being multipliable to Infinity; In Effect, besides the Greatness of their Number, each particular one might furnish out a whole Book, as being capable to be turned, inclined, and disposed in various Manners, each of which has its several Shadows. But the Labour would be useless, inasmuch as every Body will be prepared to make any at Pleasure, provided he be Master of two or three Rules already laid down for the Shadows of Objects taken from the Sun, two Kinds of Lines being shewn to contain the Means for finding all Shadows imaginable; one of the Lines coming from under the Sun, and passing over the Plan, and the other proceeding from the Sun itself, and passing over the Object, and cutting the former Line in the Place where the Shadow is to terminate. But as these Lines are to be all Parallels, that is, those from under the Sun parallel to each other, and those from the Sun likewise parallel among themselves, it may be necessary to give a Method of drawing them with Expedition and Advantage.

I have already shewn how to draw Parallels to the Base by Means of a square Board, as A, and a Ruler B, which same may serve to draw the Lines from under the Sun, when found directly over the Face of the Object, as the Line C D. But where he illuminates the Object from an Angle, another Instrument must be used, as that here represented E, which is a Rule fastened to the End of another Piece of Wood, well squared, and grooved quite through, so as the Rule F G may be moveable therein with some Force, and that having taken an inclined Line, as H D, another Parallel thereto I K, may be taken by Means of this Bevel, which is the Name the Workmen give this moveable Square E F G. This Instrument shortens the Work exceedingly, when Shadows are to be made by the Sun, on which Occasion there is no Line of any Inclination whatever, but Parallels will be required thereto. The Application will evince its Usefulness. For Shadows by the Candle or Torch, it is of no Importance, by Reason all the Lines are there drawn from a Center.



O o



*Shadows from a Torch, Flambeau, Candle,
and Lamp.*

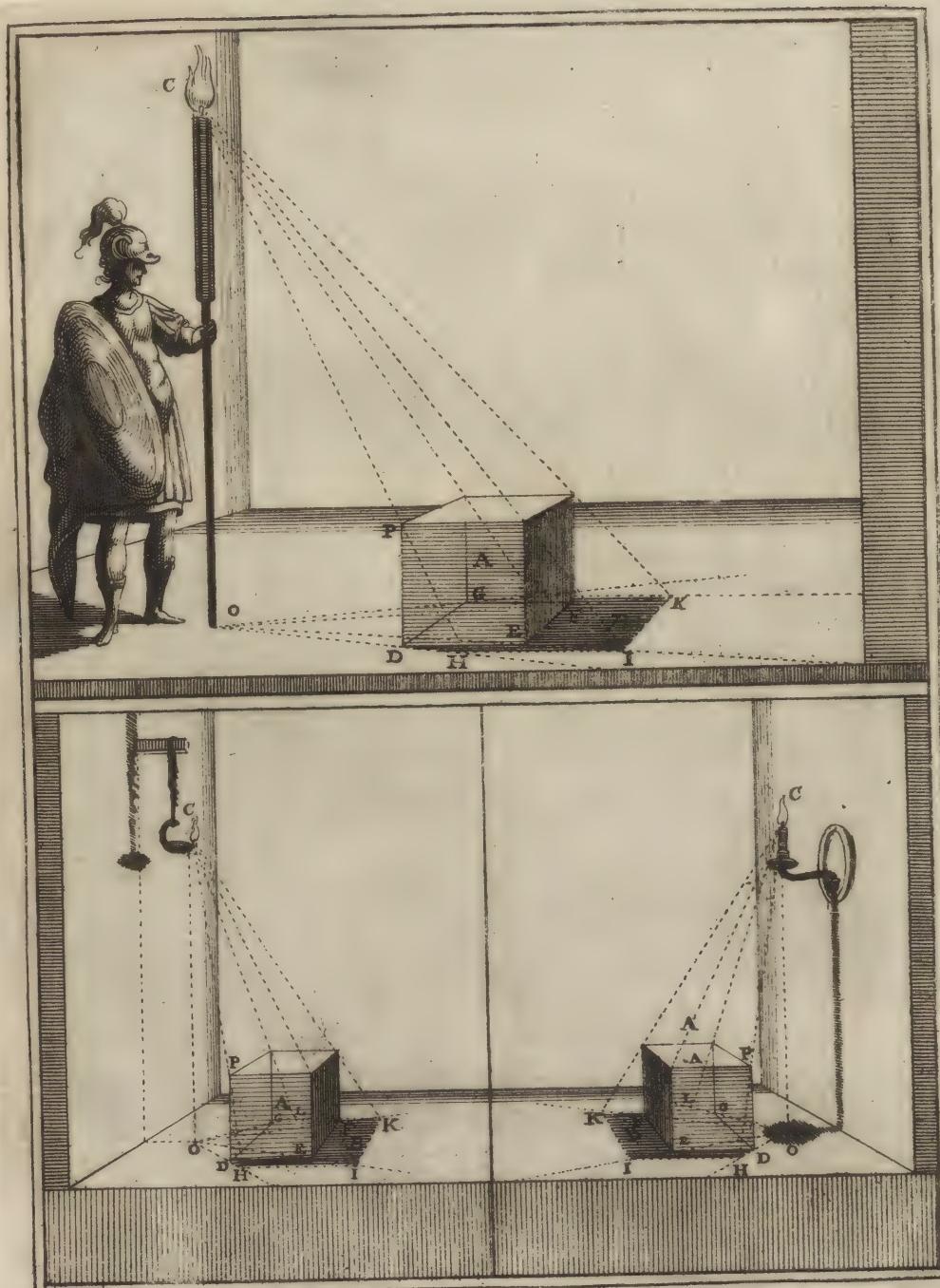
IT has been already observed, that there are two Points requir'd for the finding of Shadows; the one the Foot of the Flambeau, Candle, Lamp, &c. which is always found on the Plane where the Object is placed, the other in the Fire, or Flame of those Luminaries.

From the first Point, which is the Foot of the Flambeau, or beneath the Lamp, &c. Lines must be drawn through all the Angles of the Plan of the Object, whose Shadow is required; and the second Point gives other Rays, which passing through the Angles of those Objects, intersect the former Lines, and shew where the Shadow is to terminate. I shall illustrate this by an Example, wherein the same Letters shall be used for all the three Luminaries, from which it will readily appear, that the Practice is the same in all. With this only Difference, that the Foot of the Flambeau or Torch actually stands on the Plane, and that the others are only conceived to do so.

I add then, that if the Shadows B, of the Cubes A be required, Lines must be drawn from the Point O, which is the Foot of the Luminary, thro' all the Angles of the Plans of those Cubes, as O D, O E, O F, O G, and then from the Point C, which is the Light or Fire of the Luminaries, other Lines must be drawn through the Angles of the Objects, and continued till they intersect the former Lines from O.

Thus, having drawn a Line from the Point O, through the Angle of the Plan D, drawing another Line from C, through the correspondent Angle of the Object P, this latter Line being continued, will cut the first from the Angle D in the Point H, which Point will be the Shadow of that Angle D P. From the same Point C, do the same for all the other Angles of the Plan in the Points H I K L, which Points being connected by right Lines, give the Shadow of the Cubes, as in the three Figures. From this Instance it readily appears, that the Method is the same in one as another.

In the following Page we shall shew how to find the Bottoms or Feet of Candles and Lamps.



Of the Foot of the Luminary.

SINCE the Method of finding Shadows by the Torch, Candle, and Lamp is the same in all, as already observed, there is no Occasion for distinguishing between them in any of the following Rules. For when I put a Candle, a Torch or a Lamp might as well be put in its Place, the Light of one having the same Effect as that of any of the rest. So that for the future, we shall use the Word Light indifferently for all three.

As to the Foot of these Luminaries, which must stand on the Plans where the Objects are placed, it is found after the following Method.

A lighted Torch being in a Chamber, whether in a Corner, at a Side, or in the Middle thereof (Instances of each hereof we have in the erected Figure) we must consider all the Parts of the Room, *viz.* the Cieling, Floor, Sides, &c. as having Points wherein the Foot of the Luminary may be placed, and that from these Points Lines may be drawn thro' all the Angles of the Plan of the Object whose Shadow is required, as shall be expressed more at large in the following Page, my chief Design in this being to shew how that Point is to be found. The Torch then being placed in A, this Point A is the Foot of the Light, and B the Light or Fire of the Torch, which Fire is there supposed immoveable, tho' the Foot may be found on all Sides.

To find the Foot of the Luminary on the Side of the Wall C, draw a Parallel to the Base Line, from the Point A, till it cut the Ray D E in the Point F, from which Point erect a Perpendicular F G. Then from the Point B, which is the Fire, draw another Parallel to the Base Line, till it cut F G in the Point H, which H will be the Foot of the Luminary; as if the Torch were laid all along its Fire still remaining in the Point B.

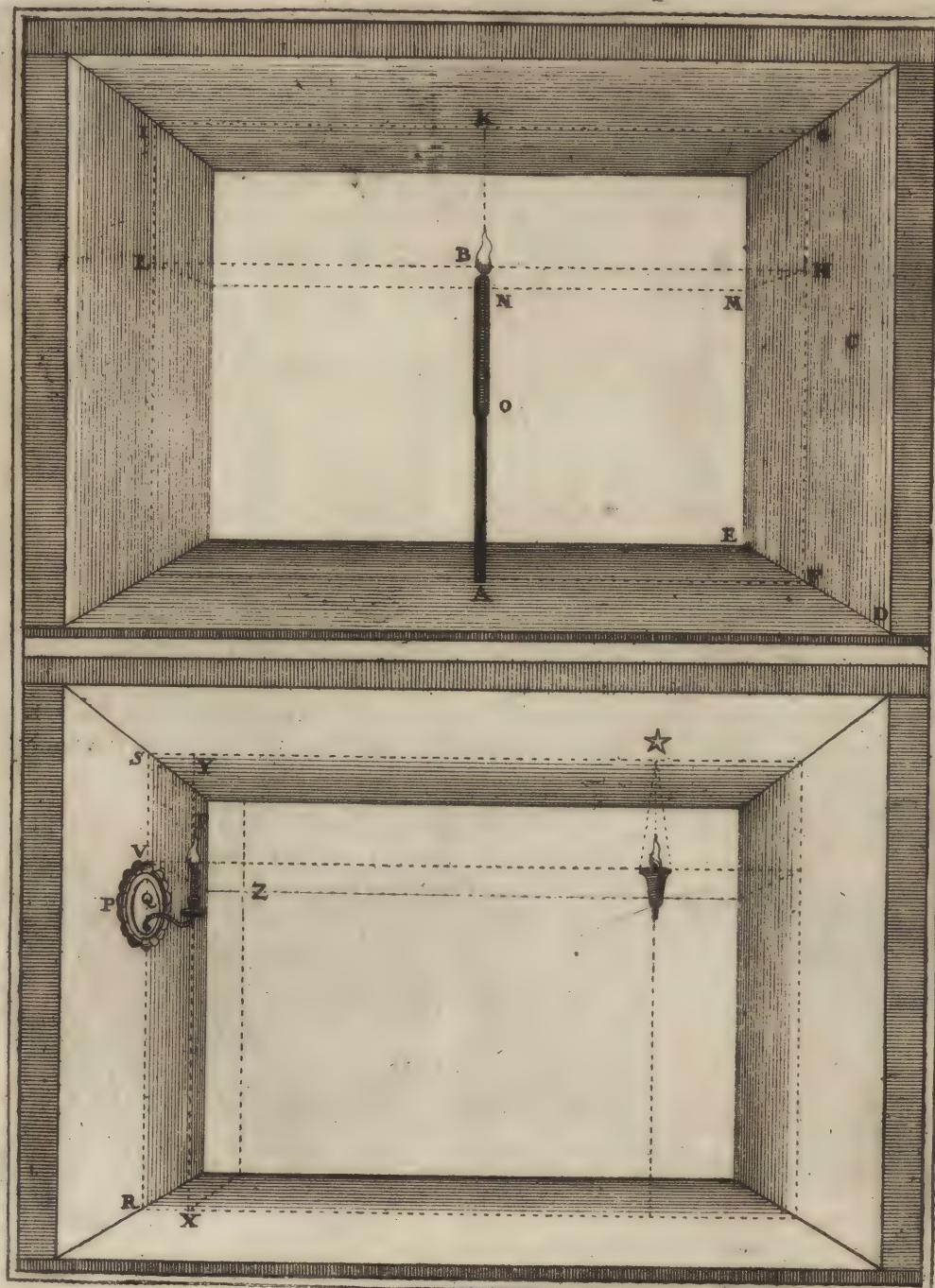
To find the Foot of the same Luminary on the Cieling, from the Point G draw a Parallel to the Base Line, as G I, and from the Point B erect a Perpendicular to the same G I; this gives the Point K for the Foot of the Luminary, as if the Torch were turned upside down.

To find it on the other Side of the Room, the same Method must be observ'd as for the Side C, and you will have the Point L.

To find the Foot of the Luminary in the Middle of the Room, draw a Line from the Point H, to the Point of Sight, till it cut the Perpendicular E in the Point M. Then from M draw a Parallel to the Base Line, intersecting the Torch in the Point N; this Point will be the Foot of the Luminary for the Middle of the Room.

The Foot of a Candle is found after the same Manner as that of a Torch, taking the Middle of the Foot of the Candlestick for the Foot of the Luminary; but when it is a Plate, or an Arm fixed in the Wall, 'tis this Arm or Branch, that determines the Line where the Foot of the Luminary shall be. For Instance, in the Plate P, through the Arm Q, draw a Perpendicular to the Base Line as R S. Then from the Fire T, draw a little Parallel to the Base Line, which cutting R S in the Point V, gives the Foot of the Luminary for that Side. The Point X will be the Foot for the Floor; the Point Y for the Cieling, and Z for the front Wall of the Room.

As to Lamps, 'tis the Place they are hung in that determines the Foot, as here the Character*; from which Place a Parallel to the Base Line is drawn as far as the first Ray, &c. The rest the same as in the Torch or Candle.



To find the Shadows of a Torch on all the Sides of a Room.

THE Shadows taken from the Sun always tend towards the Earth, by Reason that Star never gives us any of its Light, but when above our Horizon, and of Consequence raised above our ordinary Objects, and so occasioning their Shadows to descend. But the Case is different in Torches, Candles, and Lamps, which may be placed either above, below, or aside of Objects, and therefore may yield Shadows on all Sides, as we are now to shew.

The preceding Figure will help to find the Shadows of Objects disposed on all Sides of the Room, for having found the Foot of the Luminary as already directed, there is nothing difficult behind, the Method throughout being the same with that for the Cube in *Pag. 141.* to which Recourse may be had. However, to save you the Trouble of going so far back, I shall here observe, that to find the Shadow of the Table the Torch is placed in, you must draw Lines from the Foot of the Torch A, thro' all the Feet of the Table C. Then from the Point of Light B, draw Lines over all the Points of the Table I, I, I, &c. till they intersect the Rays C, C, &c. in the Points O, O, &c. which will give the Bounds of the Shadow of the Table.

The Shadow of the Object D is found by drawing Lines from the Point A, through all the Angles of the Plan, as far as the Angle of the Wall D, and from that Angle raising them perpendicularly. Then from the Point of the Light B, drawing Lines over the Object D, and observing the Angles corresponding to the Lines of the Plan, you will have the Shadow F of the Object D.

The Shadows of all the other Pieces are found after the same Manner: So that all we shall here note, is the Foot of the Luminary, the Fire itself being supposed to be fixed in the Point B.

For finding the Shadow of Figure G, the Point L is the Foot of the Luminary.

To find the Shadow of Figure N, the Point H is the Foot of the Luminary.

To find the Shadows of the Figures I and M, the Point K is the Foot of the Luminary.

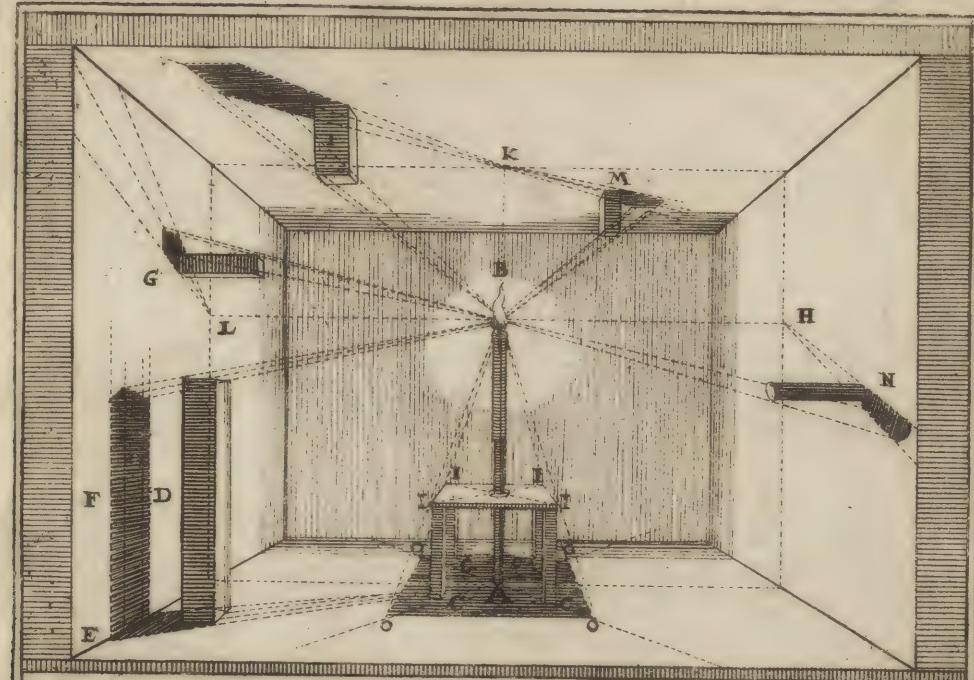
For the second Figure, having found the Foot of the Luminary on all the Sides of a Room, as directed in the preceding Page, the Shadows of Objects are found in any Place at Pleasure by the Rule now delivered. For Example, having found the Foot of the Luminary Q, and its Fire P, if you would have the Shadow of the Object R, draw Rays from the Point Q, over the Plan of Object, continuing them indefinitely. But inasmuch as they meet with the Wall, or Side of the Room T, in the Places S and S, where they meet the same, they must all be raised; then drawing other Lines from P, over the same Object R, they will cut those of the Plan, and mark the Place of the Shadow upon each, observing that the Angles refer to the Lines drawn from the Plan.

This Method is so universal, that a Man who only knows how to take the Shadow of a Cube, will make no Difficulty of finding the Shadow of any other Object whatever. For this Reason, having described that Method for the Cube in *Pag. 141.* and added this above, which in Effect is the same; I imagine I have given abundant Instruction for the managing of all Shadows, and may be excused from repeating the same in the several Figures following. Wherein all I shall note, is the Point for the Foot of the Luminary.

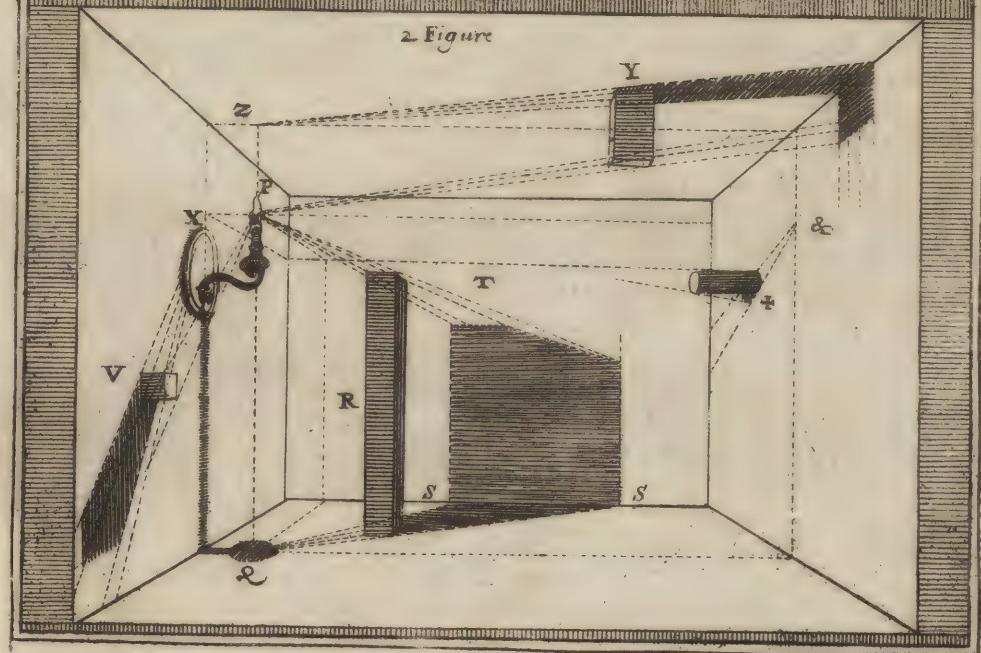
To find the Shadow of the Figure V, the Point X is the Foot of the Luminary.

To find the Shadow of Figure Y, the Point Z is the Foot of the Luminary.

To find the Shadow of the Figure +, the Point & is the Foot of the Luminary. P is the Fire, or Light itself, for all the Objects in the second Figure.



2. Figure





*The Shadow of an erect and inverted Pyramid
by Torch-light.*

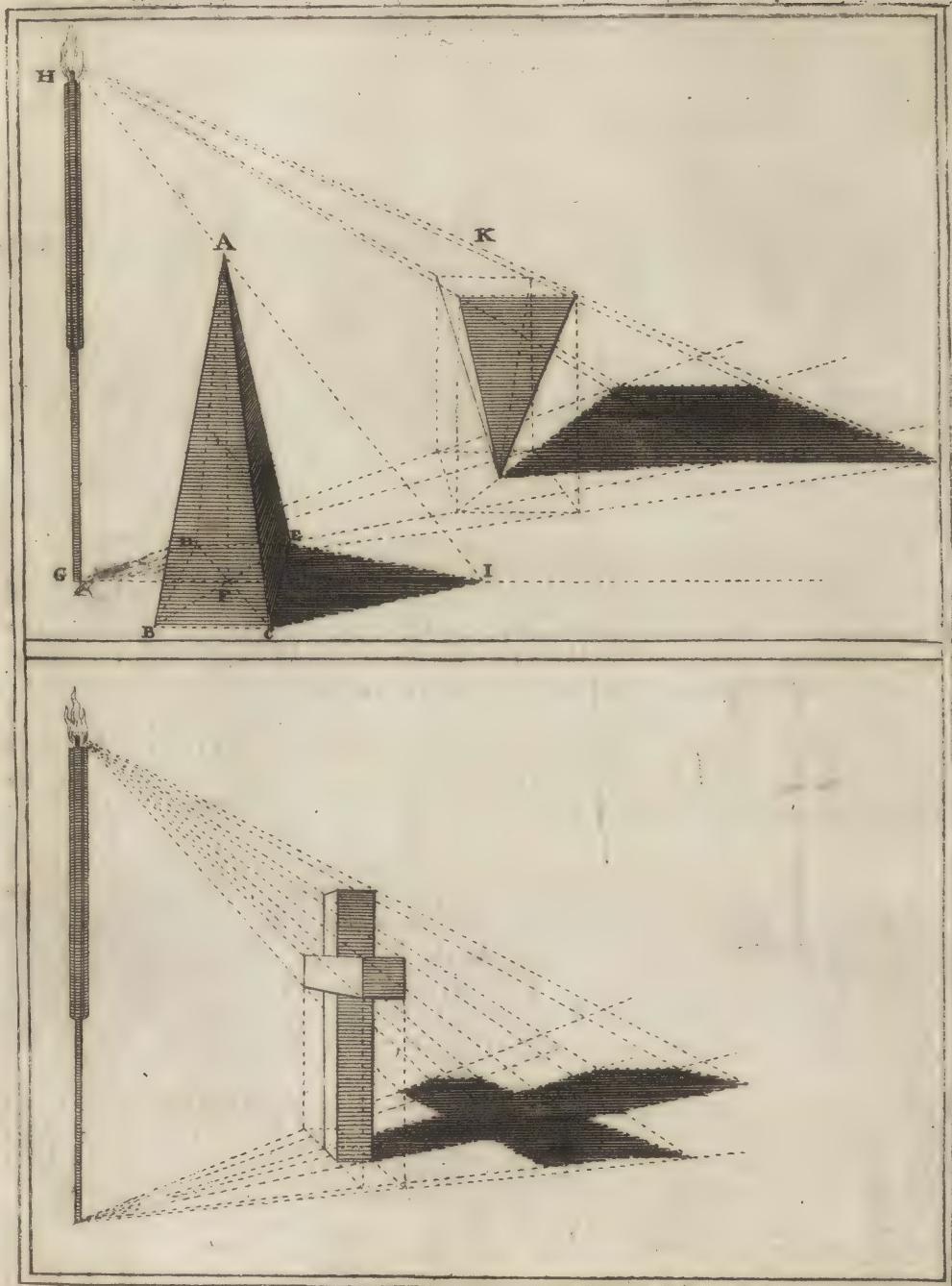
THE Shadow of an erect Pyramid by Torch-light, falls as it would by the Light of the Sun, and in both Cases there is but one Line, wherein the vertical Point of the Pyramid will be found. Upon the Plane B C D E draw the Diagonals E B, and D C, through the central Point F, raise the Perpendicular F A, and from the four Points B C D E, draw Lines to the Point A, and the Pyramid will be erected. Then, to find its Shadow, draw an indefinite Line from the Basis G, of the illuminating Body, passing through F, and from the central Flame of the Torch H draw another Line over the Vertex of the Pyramid in the Line G F, till it cut the Point I, which Point will limit the Shadow of the Pyramid. Lastly, draw a Line from C to I, and another from E to I, and the Triangle C I E will be the Shadow of the Pyramid.

To gain the Shadow of an inverted Pyramid, draw perpendicular Lines from the angular Points of its Base, and form the subjacent Plane by Means thereof, after the Manner directed for the Sun, *Pag. 138.* And from all the Angle of this Plane, draw Lines to the Base of the Torch G, then from H, the central Point of the Flame draw other Lines, touching all the Angles of the Base of the inverted Pyramid, and dividing those of the Plane, whereby the Shadow will be defined; as we before observed, in other Instructions relating to the Torch.



The Shadow of a Cross.

WE before considered the Shadow of a Cross by the Sun, let us now suppose the same Object placed in the Light of a Torch, that we may find the Difference between the two Cases. The Construction of the latter is obvious enough, particularly if compared with the Method of finding the Plane, delivered in *Pag. 137.* and the other Directions laid down for Shadows by Torch-light.





To find the Shadows of round Objects by Torch-light.

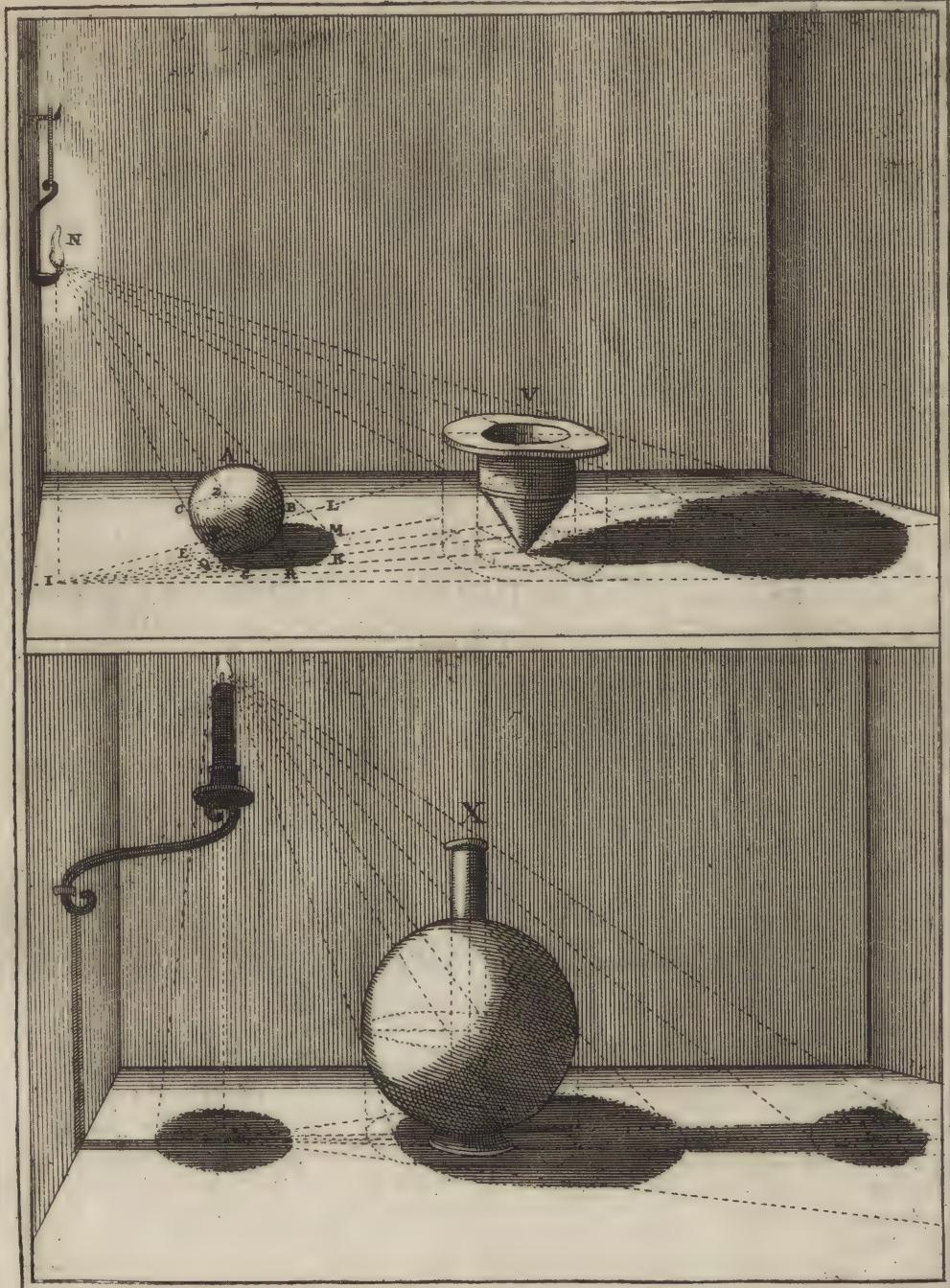
THREE may seem to be more Difficulty in representing the Shadows of Globes, Bottles, Drinking-Vessels, and other bellied Objects, by Torch-light, than in those of square ones, but the Directions already given will serve for these also; for there is nothing more required here, but to reduce Squares to Rounds, as we taught in Pag. 19, 20, 28, 29, and 86. which contain all the necessary Instructions for giving the Plans of round Objects in Perspective, whence all other Cases of that Kind may be easily understood.

We gave in Pag. 138. the Method for finding the Plan of a Ball, and by Means of that Plan, the precise Magnitude of the Shadow by the Sun. But as the Case of the Torch differs from that, we shall be a little more particular upon the Ball, because it will facilitate all the other Directions relating to Rounds.

Having by Means of a Pair of Compasses, marked out the great Circle of the Ball A, draw its Diameter BC, and below this Circle draw a Line parallel to BC, touching the Circle in the Point H. Then from the Extremes of the Diameter BC, let fall Perpendiculars upon the Line below, as BD, and CE, and with these Points D and E, make a Plan, DEFG, in the usual Manner, the Diameter whereof, FG, will divide DE at the Point H. And this Plan will serve to find the Shadow of the Ball A. Now, having drawn from the Basis of the illuminating Body I, Lines touching this Plane on both Sides, as IK and IL, and another IHM, through the Center of the Plane H, as also Lines from the Center of the Flame N, which touching the Ball between A and B, shall divide the Line IH at the Point M: This Point must terminate the Shadow. To gain the first Part of this Shadow, draw from the same Point N, another Line, touching the Fore-part of the Ball, and dividing also the Line IH at the Point Q, then the Distances between Q and M will be the Length of the Shadow. And for its Breadth, draw from the same Point N, two Lines touching the Extremes of the Diameter of the Ball ZZ, and dividing the Lines IK at the Point R, and IL at the Point S. Now then, as RS is the Breadth of the Shadow, and QM the Length of it, if the four Points R, S, Q, M, be joined with curve Lines, there will be an Oval formed for the Shadow of the Ball A.

I have been the larger upon this Shadow, because I judge the Direction given about it alone sufficient for finding the other Shadows of Rounds, as of the Object V, for Example, which having two unequal Breadths, ought to have a Plan of two Circles. And the Figure X having three, should have its Plans corresponding thereto, one for the Neck of the Bottle, another for its Belly, and a third for its Foot; all which are to be made as those for the Ball.

An Inspection of the Figures will render any farther Explanation of them unnecessary.



145

P p 2



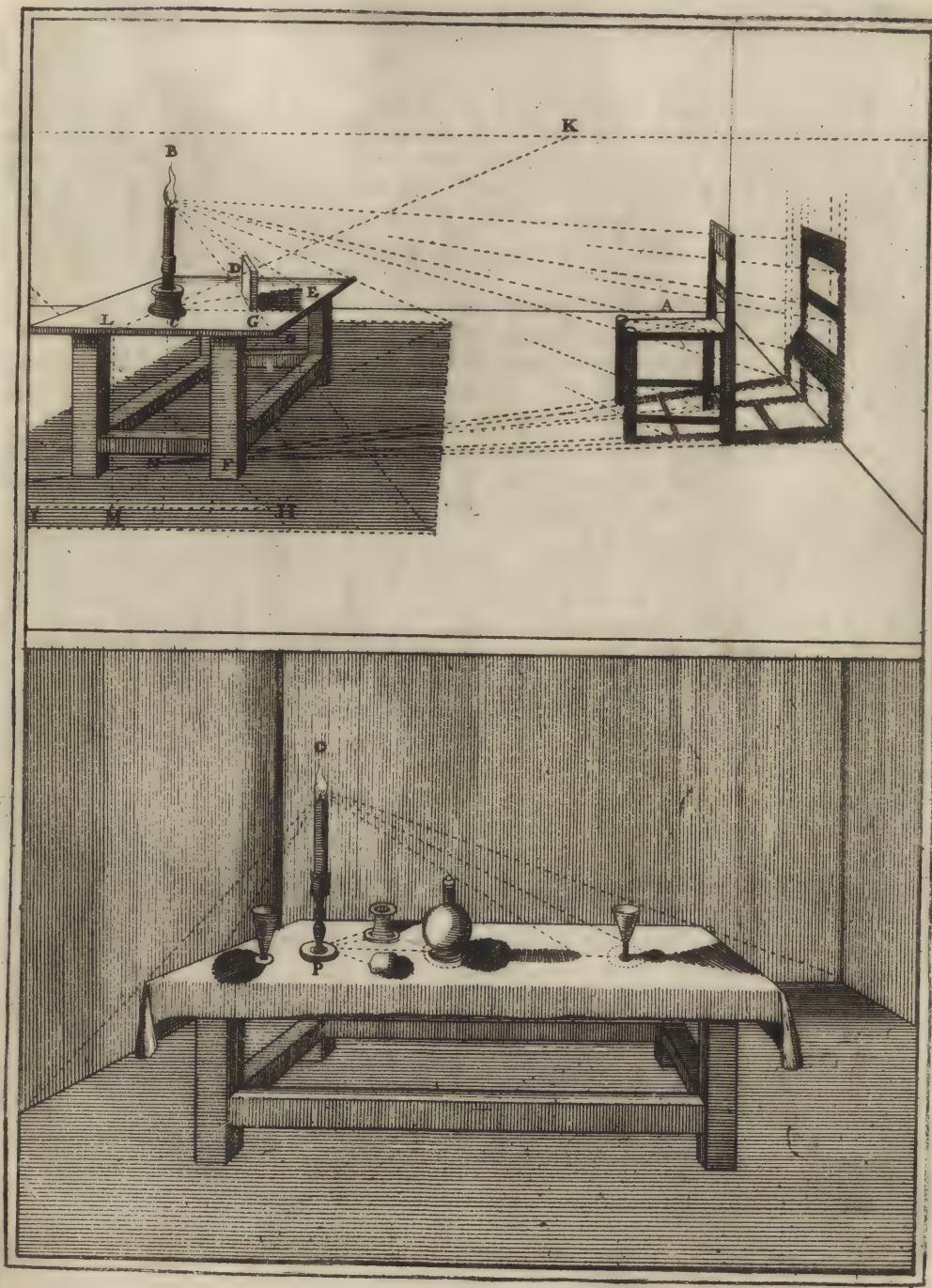
Shadows on several parallel Planes.

THE first Plane here is the Floor whereon the Chair A stands; the second Plane is the upper Part of the Table, parallel to the first, and may be either above or below it. There might also be more of these Planes wherein to find the Foot of the illuminating Body, in order to come at the Shadow of the Object. Suppose the Foot of the illuminating Body to be C, and the Flame B; from these Points C and B draw Lines through the upper and under Part of the Object D; which will give the Shadow E upon the Table.

To find the Shadow of the Chair A, which is placed on the Ground; determine the Foot of the Luminous on the Table in C, on the Ground: This is clear'd by the Instructions following.

From the Point of Distance, which is here suppos'd without the Limits of the Paper, draw a Line thro' the Foot of the Table F; then from the Angle G upon the Table, let fall a Perpendicular, cutting the Line F in the Point H; and from H draw a Parallel to the Base H I, which is equal to the upper Part of the Table, and will direct us to the thing requir'd. For, drawing a Line from the Point of Sight K, through the Foot of the Luminous C, to the Extremity of the Table L; from the same Point L, let fall a Perpendicular to H I, which will give the Point M. Then from M draw a Line to the Point of Sight K; in which Line M K will the Foot of the Luminous be found. To determine the precise Point let fall a Perpendicular from the Point C, which, cutting the Line M K, will give the Point N for the Foot of the Luminous. This Point N thus found, there will be no Difficulty in finding the Shadow of the Chair A; the Method being the same as for the other Objects taught in the preceding Pages: That is, from the Foot of the Luminous N draw Lines through all the Angles of the Plan of the Chair, and other Lines through the upper Part of the Chair, from the Luminous B; these latter by intersecting the former express the Bounds of the Shadow. For the rest the Figure gives sufficient Directions.

The second Figure is not here added as if there were any particular Circumstances different from those of the Figure above, but only to put you upon recollecting what has been already taught, viz. That Objects cast their Shadows differently, according to their different Dispositions about the Luminous. Thus, the little Objects on the Table project their Shadows this or that way, as the Luminous is on this or that Side; as is found from the common Rules relating to the Foot of the Luminous, and the Light itself. Most of the Objects here represented are broader at the Top than Bottoms; so that it will be necessary to make Plans thereof, after the manner already shewn.



Shadows of Cielings by Torch-light.

THESE Figures are not placed in the Sun's Light, because that Luminary is high above all the Objects of the Earth, and consequently can give no Shadow where the illuminating Body is supposed to be under the Object. If it be said, tho' the Sun's Rays enter a Room, yet the Shadows of Bodies continue to appear; I answer, that such Shadows are not immediately caused by the Sun, but the Brightness thereof, and that they cannot be represented by parallel Lines, as those of the Sun, but by Rays issuing from the same Center, as those of a Torch, taking the reflecting Body for the illuminating Point, and proceeding in drawing such a Shadow as in the Case of a Torch.

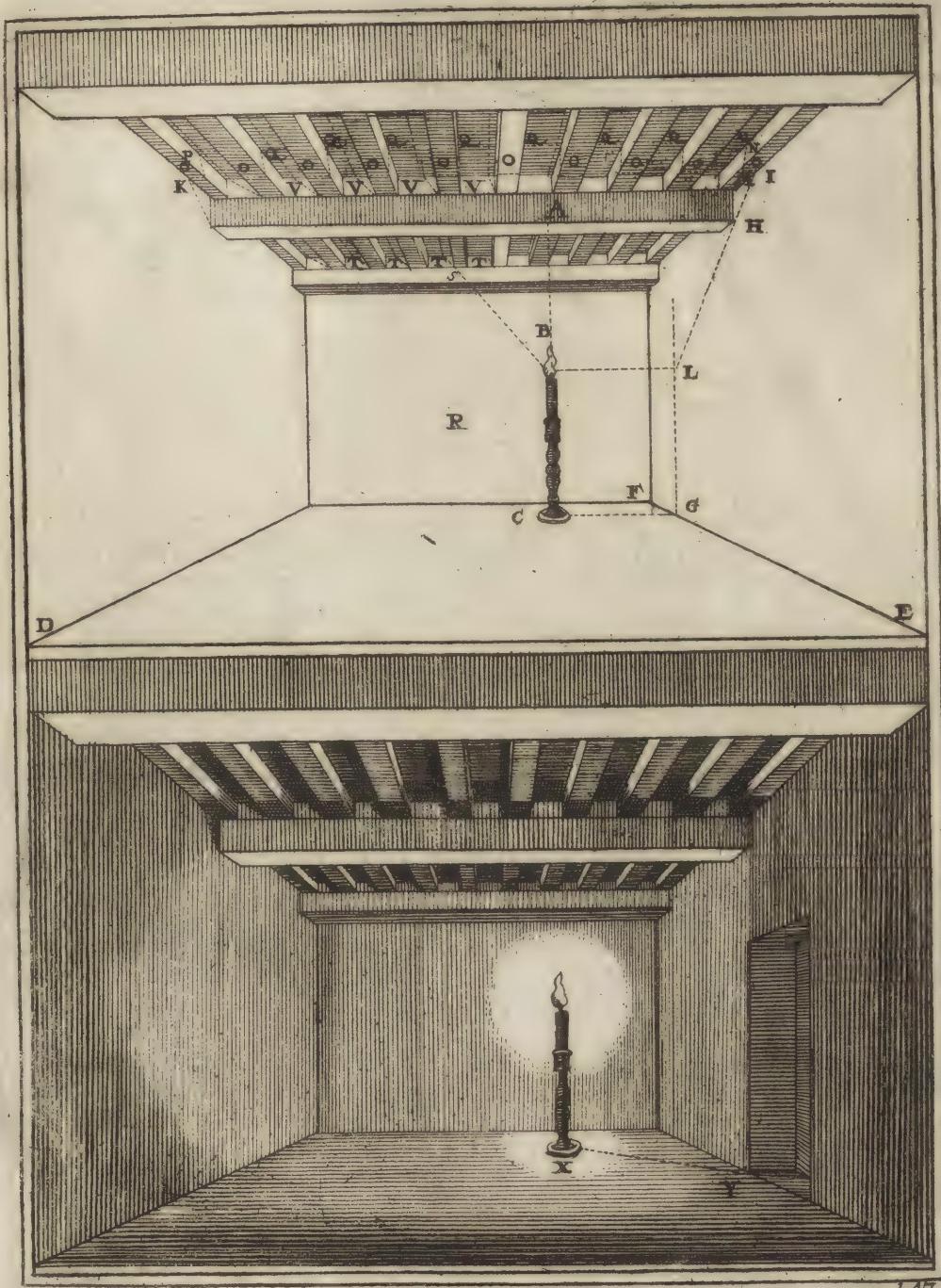
The Directions hitherto given, which turn upon the forming of Plans, and drawing of Lines from the Angles of Objects, to find the Bounds of the Shadow, would be too tedious here, and the great Number of Lines necessary to be drawn, would render the Figure exceeding intricate, on Account of the several Beams, Supporters, and Rafters that would occur. This Inconvenience drove me to invent a short, easy, practical Method for the same Purpose, without departing from the Rules of Art.

The Floor being put in Perspective, as was taught in Pag. 55, and 57. and the illuminating Body fixed, we must inquire by Means of the Basis of that Body where the illuminating Point ought to be. To find this Point, when the illuminating Body is at B, draw from the Foot of it C, a Parallel to the Base D E, till it cut the Ray E F in the Point G, from this Point G, raise a Perpendicular G L, and from the Flame of the Torch B draw a Parallel to D E, dividing the Perpendicular G L at the Point L, and this Point L will give the Place and Length of the Shadow.

For Example, to find the Shadow of the Band A, from the Point L draw a Line, touching the Vertex of the Angle H, and observe where this Line L divides the first Rib, as at the Point I, which is the Place of the Shadow's Ending. From this Point draw a Parallel I K, and mark upon the Ribs the Place of the Shadow O. And to find the Shadow of the Space betwixt them, draw another Line from the Point L, touching the Vertex of the Angle of the first Rib M, which will divide the Angle of the Interval at the Point N. Now then, from the Point N draw a Parallel N P, and you will thence have all the Shadow Q for the Beam A.

To find the Shadow of the Joists, draw a Line from the illuminating Point B, touching the Angle S, and dividing the Bottom of the Entablature at the Point T. Proceed thus with all the other Ribs, and the Shadow will appear to be longer the farther 'tis removed from the luminous Body. Then mark upon one Beam all the Points T, and from the Point of Sight R, draw Lines through each of these Points, and then the Shadows of all the other Ribs will fall exactly between the Bands, as we see in the Points V V.

The second Figure is the same with the former, and differs from it only in being shadowed, which would have obscured the Letters and the fine Lines necessary in the other: Only here the Shadow of the Jaumbs of the Gate must be taken from the Foot of the illuminating Body, as in X and Y.



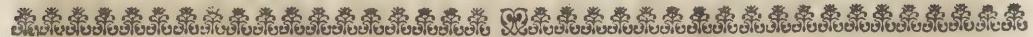


To find the Shadow by the Foot of the Luminary.

If the Objects be perpendicular to the Base Line, and higher than the Flame of the Candle A, we need only draw Lines from the Foot of the Luminary B, thro' the most advanced Angles of the Objects, e.g. C and D of the Skreen, Fig. I. and others from the Angle of the Wall E. These Lines BC, BD, and BE, give the Place of the Shadow in the Points where the Angles made by the Leaves of the Skreen, meet the Floor; as also the Return of the Wall in the Point G, from whence Perpendiculars must be raised, as GR, which will terminate the Shadows given by the Candle A.

The Reason hereof is, that the Line AB being parallel to the Line CH, DI, KL and EL, occasions the Flame, in what Part soever of the Line AB it be found, whether on high, in the Middle, or below, to give a like Shadow.

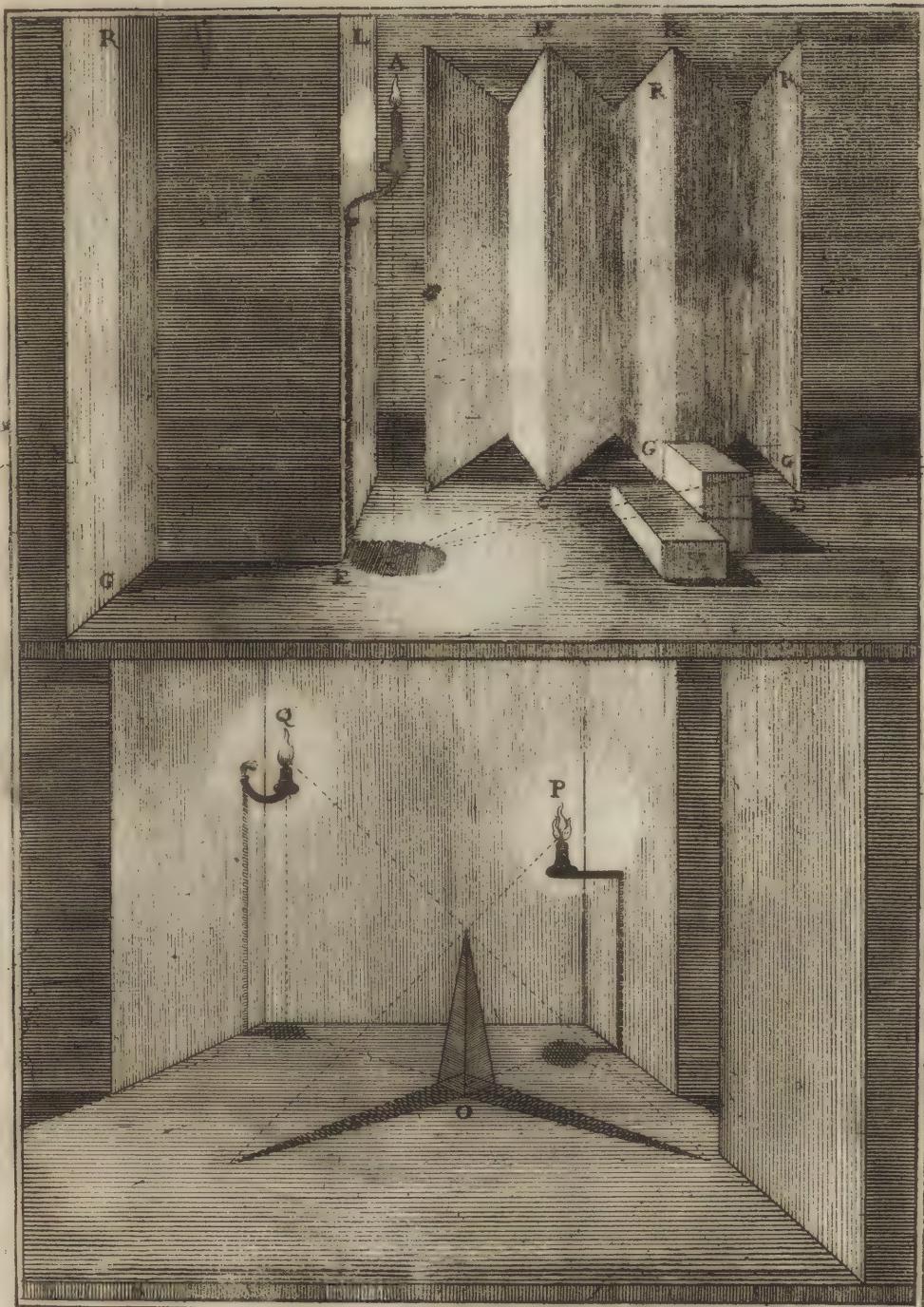
It must here be observed, that this Rule only holds good of Objects raised above the Flame, as these are in the present Figure. For such as shew their upper Part, as here the Object M, the preceding Rules take Place; that is, Lines must be drawn from the Foot and Flame of the Luminary.



The Shadow doubled.

WHEN two Luminaries shine on the same Object, two Shadows must be produced, each of the Luminaries occasioning its respective Shadow, and that in Proportion to the Circumstances of the Luminary. If such Luminaries, when at equal Distances be equal, the Shadows themselves must be equal; but if there be any Disproportion, that is, if one of them be a little bigger than the other, or one of them a little nearer the Object than the other, the Shadows will be unequal. Thus the Object O being illumined by two Candles, the one near at Hand in P, the other farther off in Q, it is evident, the Shadow of the Candle P will be deeper than that of the Candle Q, as is expressed in the Figure.

The Rules for such Shadows are the same with those already given both for the Sun and the Torch.

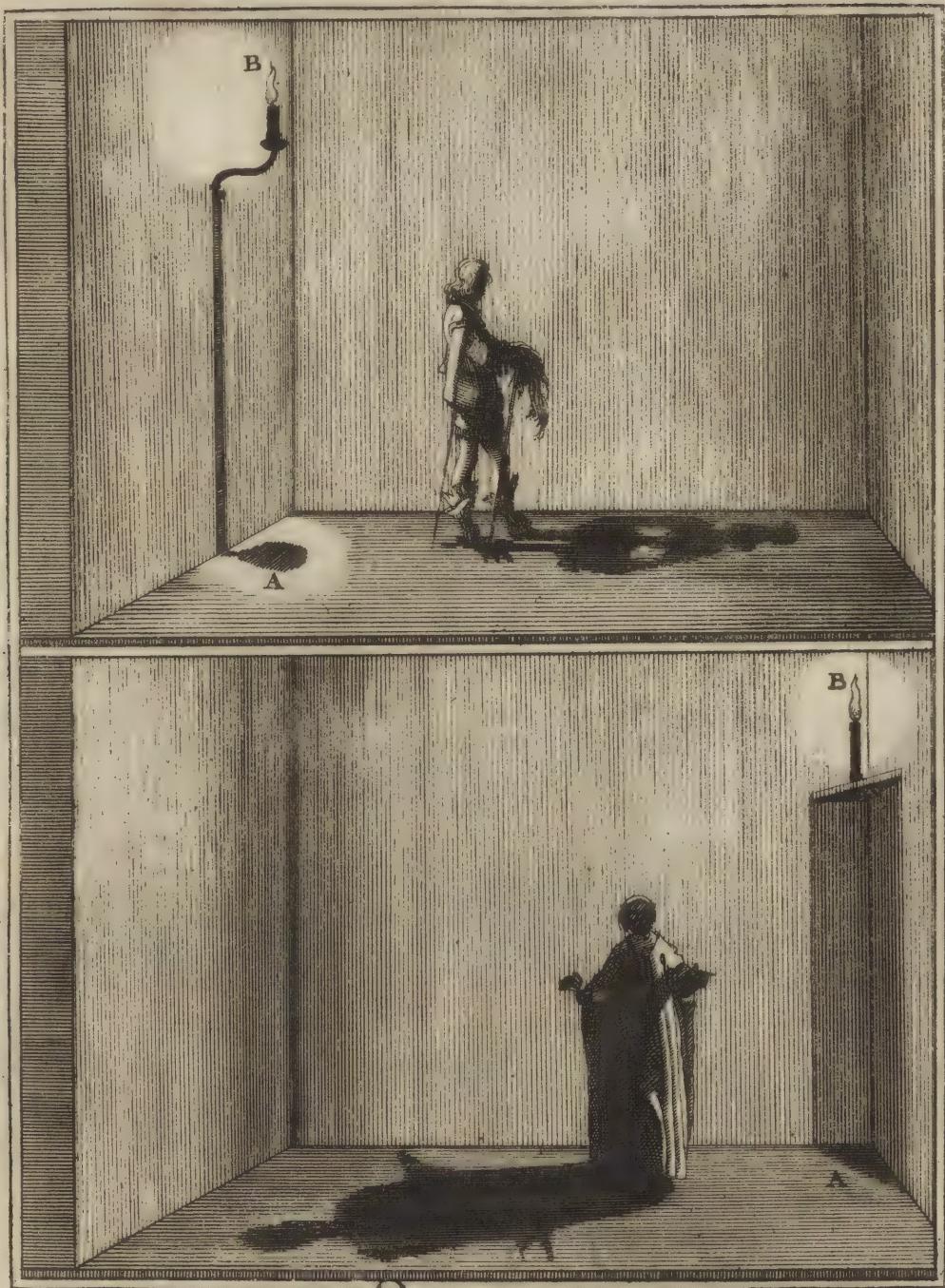




The Shadows of human Figures of Torch-light.

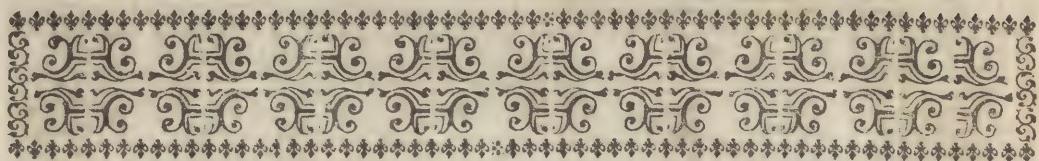
I HAVE reason to hope that the Advice given long ago, not to turn over the Page to a new Figure, before the preceding one be well understood, has been carefully observ'd. Supposing therefore my Reader to have master'd what was directed in *Pag. 139.* for finding the Shadows of human Figures by the Sun; I have little to add as to those in the present Plate; the Line drawn under them, which I use as a Plan, serving indifferently in either Case. But inasmuch, as the Shadow projected from a Torch is not equal to the Body, as is the Shadow projected by the Sun, a farther Consideration must here be added, *viz.* that instead of drawing the Lines parallel to one another, they must here be all drawn from a Center; that is, all the Lines drawn over the Plan must proceed from the Foot of the Luminary A, and those over and about the Figure, from the Point of the Flame; in like manner as for the other Shadows of the Torch; which it would be needless here to repeat, the Figure itself giving abundant Satisfaction.





Q q 2

149



*The different Dispositions and Heights of Shadows
by Torch-light.*

SHADOWS from the Sun are all cast the same Way, and have the same Disposition; it being impossible the Sun should occasion one Shadow to tend towards the East, and another towards the West, at the same time. True, in different times of the Day it makes this Difference: but never in one and the same Hour.

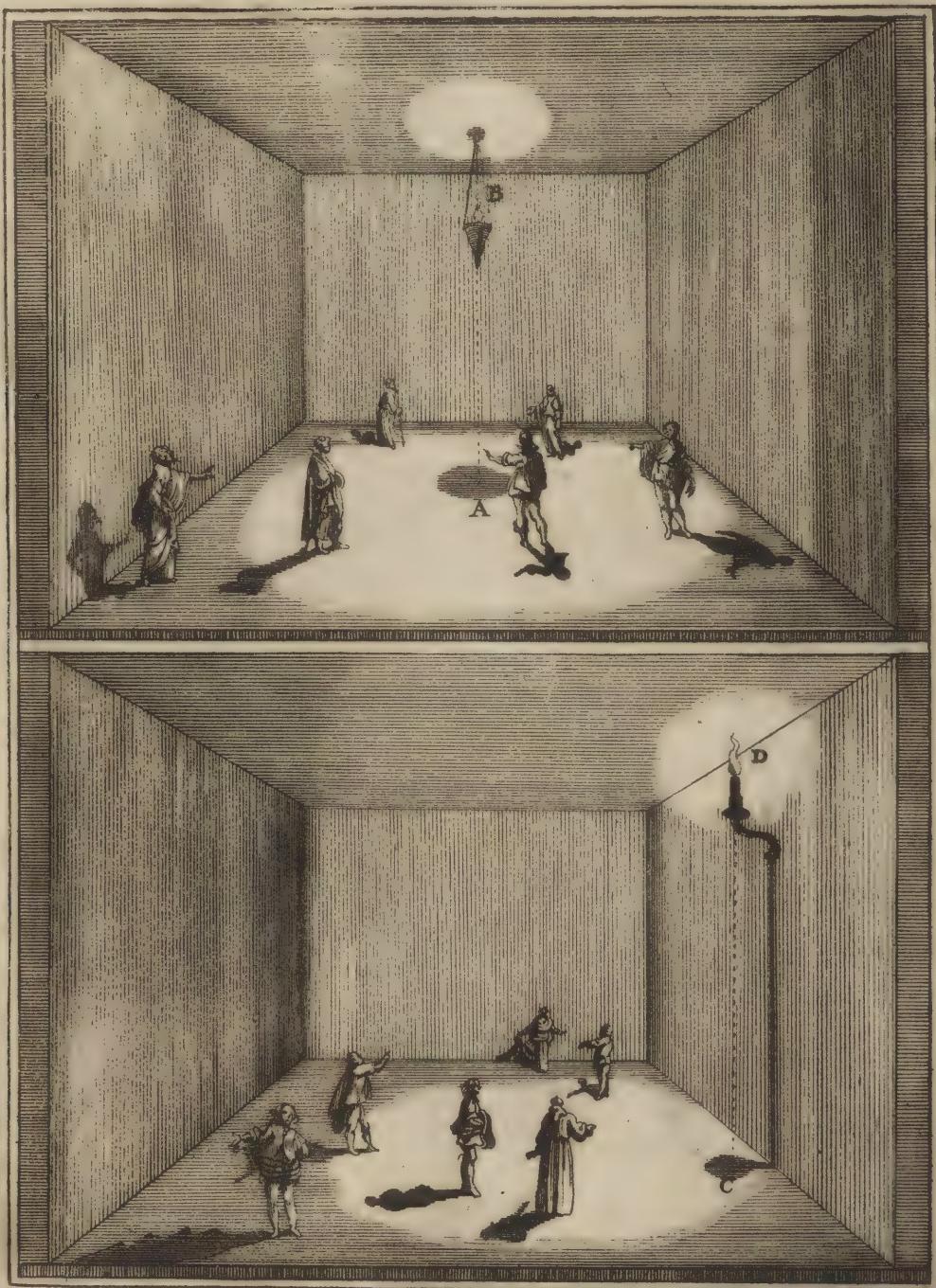
But the Torch, Candle, and Lamp, have always this Effect; for in what Place soever one of these Luminaries be found, provided there be a number of Objects about them, the Shadows will be cast various ways; some to the East, some to the West, some to the North, and others to the South, according to the Situation of the Objects around the Luminary; the Foot of which, here represented by A, serves as a common Centre, from which they all proceed; and the Flame here represented by B, shews where they are to terminate, tho' at different Distances; as the nearest produce the shortest Shadows, and the remotest the longest.

Tho' in the second Figure the Luminary be not placed in the Middle, yet the same Rule obtains, with respect to the Shadows, as in the former Figure; being all drawn from the Foot of the Luminary C, and terminated by Lines from the Flame D.

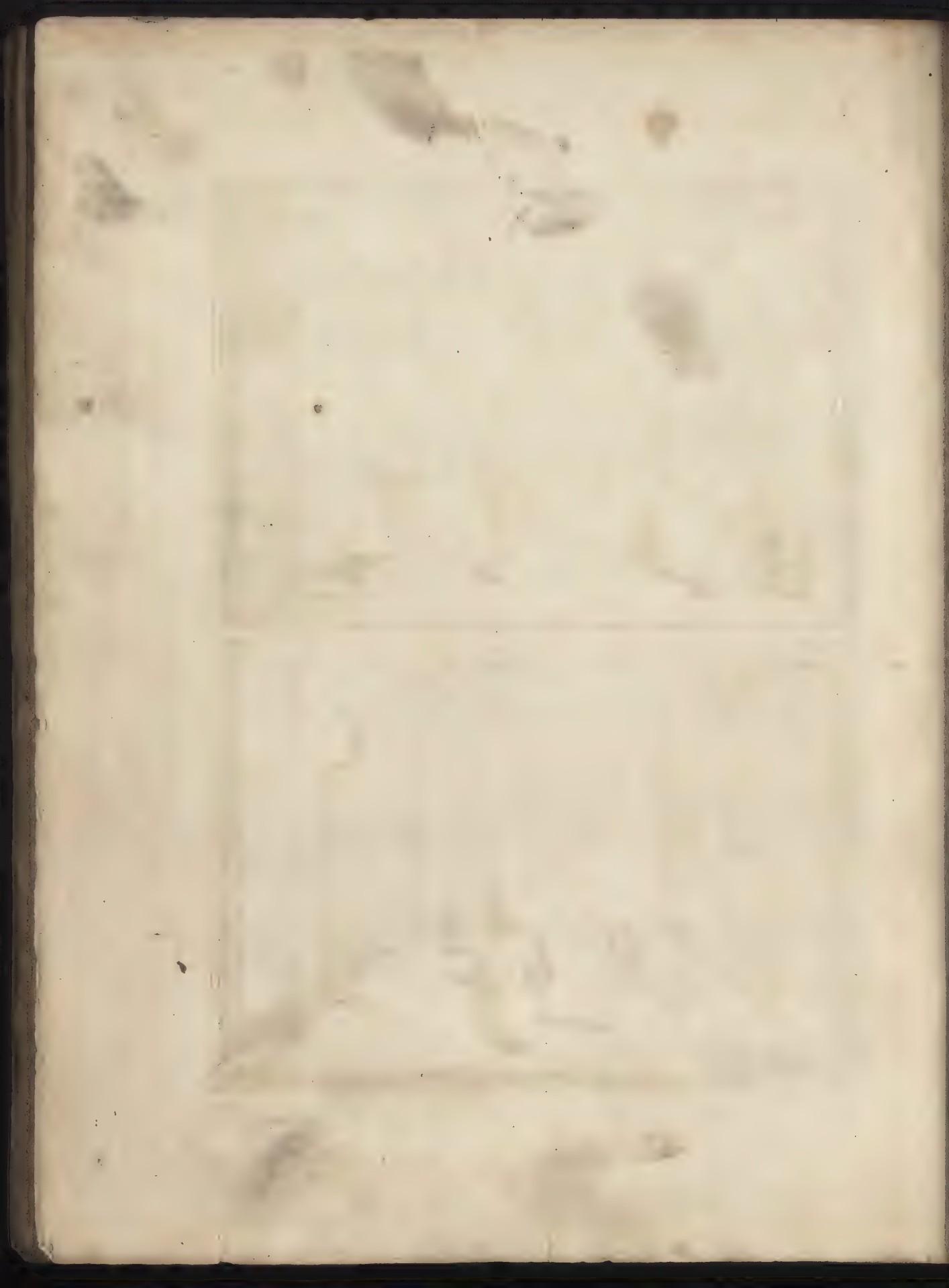
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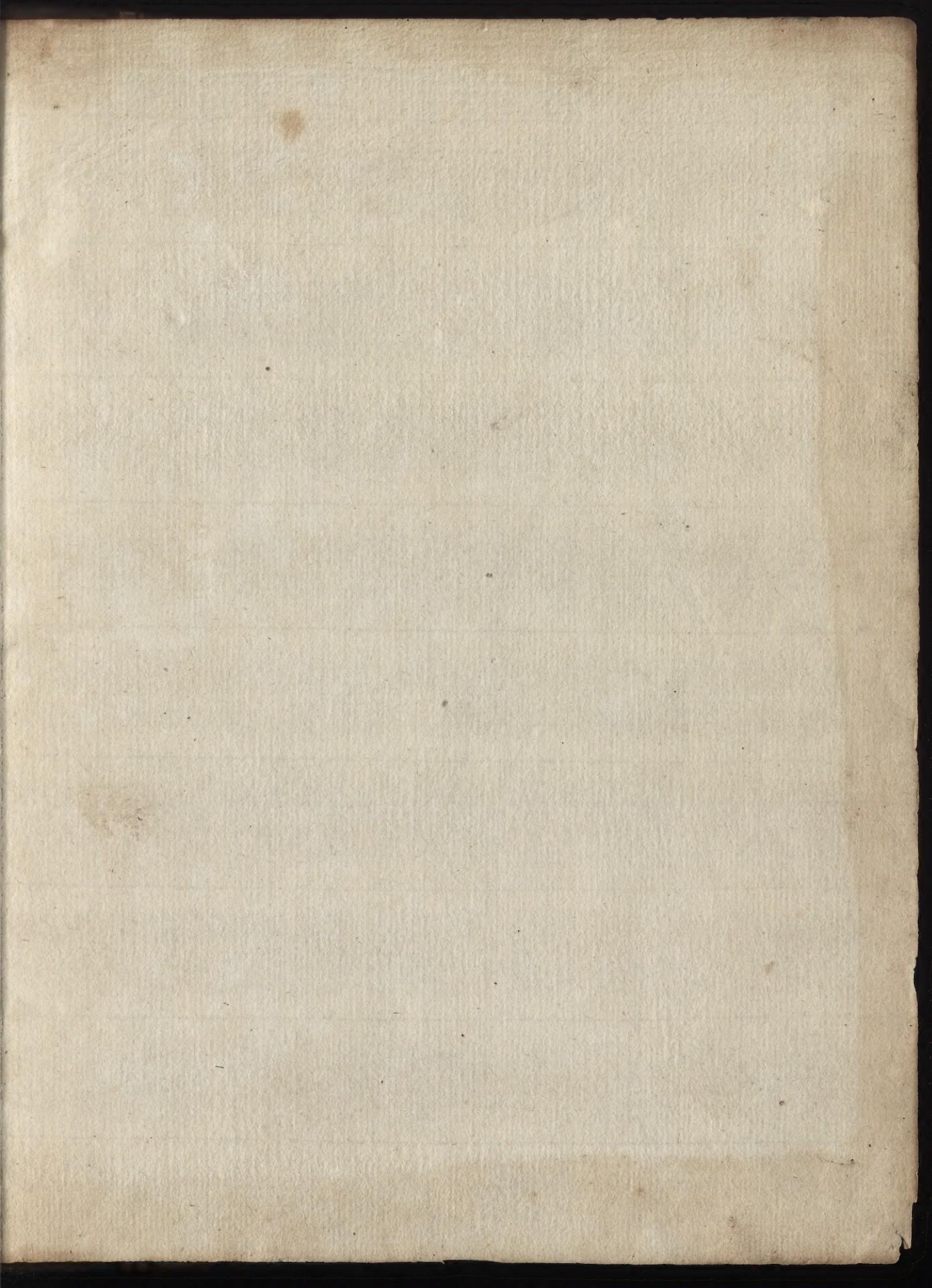
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